

Research article

[urn:lsid:zoobank.org:pub:C6BE4D70-494B-4314-9E98-F04BE61A2D17](https://zoobank.org/pub:C6BE4D70-494B-4314-9E98-F04BE61A2D17)**Identity of certain stoneflies (Insecta: Plecoptera) from Ukraine and Poland, with notes on available museum material from XIX–XX centuries****Khrystyna I. Arkhipova¹, Dávid Murányi², Wiesław Krzemiński³ & Roman J. Godunko^{4,*}**^{1,4}*State Museum of Natural History, National Academy of Sciences of Ukraine, Teatralna 18, 79008 Lviv, Ukraine*²*Department of Zoology, Eszterházy Károly Catholic University, Leányka u. 6, Eger H-3300, Hungary*³*Institute of Systematics and Evolution of Animals, Polish Academy of Sciences, Sławkowska str. 17, 31016 Kraków, Poland*⁴*Biology Centre of the Czech Academy of Sciences, Institute of Entomology, Branišovská 31, 37005 České Budějovice, Czech Republic*⁴*Department of Invertebrate Zoology and Hydrobiology, University of Łódź, Banacha 12/16, 90 237 Łódź, Poland***Corresponding author: Email: roman.hodunko@biol.uni.lodz.pl; godunko@seznam.cz*¹[urn:lsid:zoobank.org:author:E52FE784-0216-4F3B-8945-3719AE82FAA0](https://zoobank.org/author:E52FE784-0216-4F3B-8945-3719AE82FAA0)²[urn:lsid:zoobank.org:author:A1905072-B418-4EC8-B19A-B0AC579319FE](https://zoobank.org/author:A1905072-B418-4EC8-B19A-B0AC579319FE)³[urn:lsid:zoobank.org:author:78C0E530-D134-45C0-B79C-0155E3ED248F](https://zoobank.org/author:78C0E530-D134-45C0-B79C-0155E3ED248F)⁴[urn:lsid:zoobank.org:author:3125D70F-AD47-4AD9-9B20-772FA7087B1E](https://zoobank.org/author:3125D70F-AD47-4AD9-9B20-772FA7087B1E)

Abstract. Available stonefly materials collected in Ukraine during late nineteenth and early twentieth century are enumerated and analysed from the National Museum, Prague (Czech Republic), State Museum of Natural History, National Academy of Sciences of Ukraine (former Muzeum Dzieduszyckich), Lviv (Ukraine), and Institute of Systematics and Evolution of Animals, Polish Academy of Sciences, Kraków (Poland). Occurrence of two autumnal representatives of the *Leuctra prima* species group, i.e., *L. autumnalis* Aubert, 1948 and *L. carpathica* Kis, 1966 is confirmed based on old specimens, as well as presence of *Perla pallida* Guérin-Ménéville, 1843 ‘Type 2’ sensu Sivec & Stark (2002). A lectotype is designated for *Arcynopteryx carpathica* Klapálek, 1907, a junior synonym of *A. dichroa* (McLachlan, 1872). Notes on the wing venation variability of *Oemopteryx loewii* (Albarda, 1889) are presented. Additionally, *Isoperla sudetica* (Kolenati, 1859), *Dinocras megacephala* (Klapálek, 1907), *Perla bipunctata* Pictet, 1833, *Brachyptera braueri* (Klapálek, 1900), *Brachyptera monilicornis* (Pictet, 1841), *Brachyptera seticornis* (Klapálek, 1902), *Oemopteryx loewii* (Albarda, 1889), *Rhabdiopteryx harperi* Vinçon & Murányi, 2009, *Taeniopteryx nebulosa* (Linnaeus, 1758), and *Nemurella pictetii* Klapálek, 1900 are reported for Kraków collection for the first time. Corrections of the previous determinations are performed. The occurrence in Ukraine of further two species, i.e., *Isoperla sudetica* (Kolenati, 1859) and *Siphonoperla transsylvanica* (Kis, 1963), is confirmed based on recently collected material.

Keywords. Carpathians, Dziędzielewicz, Klapálek, faunistic, *Leuctra*, *Arcynopteryx*, *Oemopteryx*, lectotype, paralectotype.

INTRODUCTION

The stonefly (Plecoptera) fauna of Ukraine received active exploration during the last decades of the 19th and early 20th century, due to the activity of Józef Dziędzielewicz (*1844–†1918) and his long-term cooperation with František Klapálek (*1863–†1919), and other entomologists of the former Austro-Hungarian Empire (for more information see Zhiltzova 1966; Godunko & Kłonowska-Olejniki 2003; Godunko & Klymyshyn 2004; Diakiv 2010). Working in different cities of Western Ukraine and travelling with the aim to collect Neuroptera, J. Dziędzielewicz takes a part of support also from the side of V. Dzieduszycki that established and built the Muzeum Dzieduszyckich in Lviv. Then, J. Dziędzielewicz influenced by him returned to Lviv and worked part time as scientific secretary at the Museum. In 1915 J. Dziędzielewicz took the part of the collection of aquatic insects with

him to Myślenice village (Poland) and it was also transferred later to the Akademia Umiejętności w Krakowie [= Polish Academy of Art and Sciences in Kraków] in 1918, after his death. Dziędzielewicz’ collecting activity concerned mostly to the Ukrainian Carpathians and several other regions of former Galicja [Галичина (*Halychyna*) in Ukrainian]. However, some part of the material was also collected in the Western Carpathians within the present territory of Poland. The results of these early studies were discussed in a detailed faunistical summary published by the end of WWI (Dziędzielewicz 1918).

The old collections of the stoneflies in three museums studied contain the material from the second half of the 19th and first decades of the 20th centuries. The aquatic insect collections housed at the Museum of Natural History of the Institute of Systematics and Evolution of Animals, PAS in Kraków (further ISEA) are only a part of the larger entomological collections formerly housed at

the Museum of Physiographical Commission of the Polish Academy of Art and Sciences in Kraków (see above). Such collections as documentary material were deposited obligatorily by scientists (including J. Dziędzielewicz), who had in that way to account for money granted to them for the conduction of studies.

As a result of cooperation between Dziędzielewicz and Klapálek, numerous dried pinned specimens from the Ukrainian Carpathians replenish the Klapálek's collection which is now deposited in the National Museum in Prague (further NMP).

Another part of the specimens collected by J. Dziędzielewicz is housed at the State Museum of Natural History NAS Ukraine in Lviv (further SMNH). The first reinvestigation of the stoneflies collection in SMNH was held in 2002–2003 and some results were published by Godunko & Kłowska-Olejek (2003). However, the second part of J. Dziędzielewicz' plecopteran collection housed in ISEA remained unidentified. The resolving of some dispute questions in the field of identification and some changes in taxonomy predetermined the revision and identification of the specimens from both of these collections.

Due to confirm the identity of old Plecoptera specimens, we investigated the collections where these materials were traced, namely in NMP, SMNH and ISEA. The available museum material from Ukraine and partly from Poland is enumerated below, with notes and figures on some important specimens and diagnoses of certain taxa, completed with recent collecting that confirm identity of lacking old specimens.

MATERIAL AND METHODS

The historical specimens examined are stored dry in the Department of Entomology, Natural History Museum (NMP) and Natural Museum (ISEA), and preserved in 75% ethanol in the Laboratory of Entomology (SMNH) (for more information see Arkhipova et al. 2018). Identifications of material discussed below have been performed by us in 2002–2003 and 2012–2016.

Drawings were made with the aid of a drawing tube applied to a Nikon SMZ800 microscope. Photos were made with a Keyence VHX 5000 digital microscope and a Nikon D70s camera. Some drawings were made using a stereo microscope Olympus SZX7 and a microscope Olympus BX41, both equipped with drawing attachment. Specimen terminalia were cleared in KOH and stored in a microvial with glycerine pinned beneath the specimen. Recently collected specimens are preserved in 75% ethanol and stored in the Collection of Smaller Insect Orders, Department of Zoology, Hungarian Natural History Museum (HNHM).

Morphological terminology primarily follows Graf et al. (2012), Murányi (2011), Ravizza & Vinçon (1998) and Sivec & Stark (2002).

Distributional data were compiled from literature information from various sources referenced in Plecoptera Species File (PSF) (DeWalt et al. 2018). Distributional information of old specimens analysed based on original labels; for materials from SMNH and ISEA the original labels cited without changes.

Abbreviations used in the text

For geographical regions

BM	=	Beskid Makowski
CCA	=	Ciscarpathians
CHOR	=	Chornohora Range
GOR	=	Gorgany Range
GP	=	Great Polissya
LP	=	Little Polissya [also as 'Male Polissya']
PS	=	Pogórze Śląskie
MAP	=	Małopolska Range
PH	=	Podilska Hight
ROZ	=	Roztochchia Range
SAB	=	Sądecki Beskid
SG	=	Śląsk Górny
T	=	Tatry
WPOD	=	Western Podillya
UC	=	Ukrainian Carpathians

For collectors

CU	=	collector unknown
JD	=	J. Dziędzielewicz
FS	=	F. Schille
JF	=	J. Fudakowski
KJ	=	K. Jelski
PD	=	P. Dzieduszycki
VL	=	V. Lazorko
JW	=	J. Werchratski

Abbreviations from original labels [geographical and administrative terms]

dol. [dolina]	=	valley
Gub.	=	Gubernya [province]
p. or pot. [potok]	=	stream

localities

Ag [Angielów]	=	Anheliv village (Lvivska Region, Ukraine)
Koł. or Kł. [Kołomyja]	=	Kolomyia town (Ivano-Frankivska Region, Ukraine)
Kościel.	=	Kościelisko (Tatry, Poland)
Krak	=	Kraków (Poland)
Mik. [Mikuliczyn]	=	Mykulychyn (Ivano-Frankivska Region, Ukraine)
Mł [Młodiatyn]	=	Molodyatyn village (Ivano-Frankivska Region, Ukraine)

Rebrow [Rebrowacz]	=	Rebrovach Mt. (Ukrainian Carpathians)
Wad.	=	Wadowice (Poland)
Woł [Wołyń]	=	Volyn Region (Ukraine)
Wr.	=	Warwarynci (Ternopilska Region, Ukraine)
Zak.	=	Zakopane (Poland)

Others

Dz. or Dziendz.	=	J. Dziędzielewicz
Ogr. bot. [ogród botaniczny]	=	botanical garden
okol. [okolicy]	=	vicinity
w. [wakacje]	=	collected holiday time
?	=	sex unknown (damaged specimens)

RESULTS AND DISCUSSION

Commented species list

Family **Leuctridae** Klapálek, 1905

Genus **Leuctra** Stephens, 1836

Leuctra albida Kempny, 1899

Material. ISEA: POLAND: “Rytro”, “30/13”, SAB (FS), 1♀.

Leuctra fusca (Linnaeus, 1758)

Material. ISEA: UKRAINE: “Mikuliczyn. 1 do 5. VIII. 1904”, “126/19”, GOR (JD), 1♀.

Remarks. Widespread species in the Carpathians region, mentioned by Dziędzielewicz (1918) from locality cited above.

Leuctra autumnalis Aubert, 1948

Figs 1–4

Material. NMP: UKRAINE: “Pod Turkul, 10.IX.1908” [under Turkul Mt.], CHOR (JD), 4♂♂, 2♀♀ [as *L. signifera* Kny, det. Klapálek; one male and one female terminalia KOH boiled, pinned beneath the specimen in microvial]; “Pożyżewska [Pozhyzhevska Mt.], 9.09.1908”, CHOR (JD), 1♀ [as *L. signifera* Kny, det. Klapálek; terminalia KOH boiled, pinned beneath the specimen in microvial].

Diagnosis. Male tergum VIII with large median process having short but widely separated digits; tergum IX median sclerite with slight medial subdivision; tergum X with paired spike-like posterior process by the posteromedial hollow. Female subgenital plate with posterior lobes not divided, posterior margin rounded; sternum IX with slight, V-shaped anteromedial hollow.

Remarks. The closely related species *L. signifera* Kempny, 1899 was described from Gutenstein, Lower

Austria, and for several decades all autumnal members of the *L. prima* group were reported under this name (Mosely 1932). The first related species that was distinguished is *L. autumnalis*, originally described from Switzerland (Aubert 1948). Its occurrence in the Carpathians was proved in the 60ies, reported simultaneously from Romania (Kis 1963a), Slovakia and the Czech Republic (Raušer 1965), and Ukraine (Zhiltzova 1964). Presence of *L. signifera* in the Carpathians was questioned (Kis 1966; Zhiltzova 1968) and it was not reported since but seems to be restricted to the Eastern Alps and its foothills in Austria, Hungary and Slovenia (Ravizza & Vinçon 1998; Graf & Weinzierl 1999; Kovács 2006). Contrary, *L. autumnalis* is a widespread Alpine-Carpathian species extending also to the Jura (Ravizza & Vinçon 1998; Ravizza 2002). The present Ukrainian specimens of the NMP were originally identified as *L. signifera* by F. Klapálek (based on the handwrite of the det. label), but not enumerated in publication before.

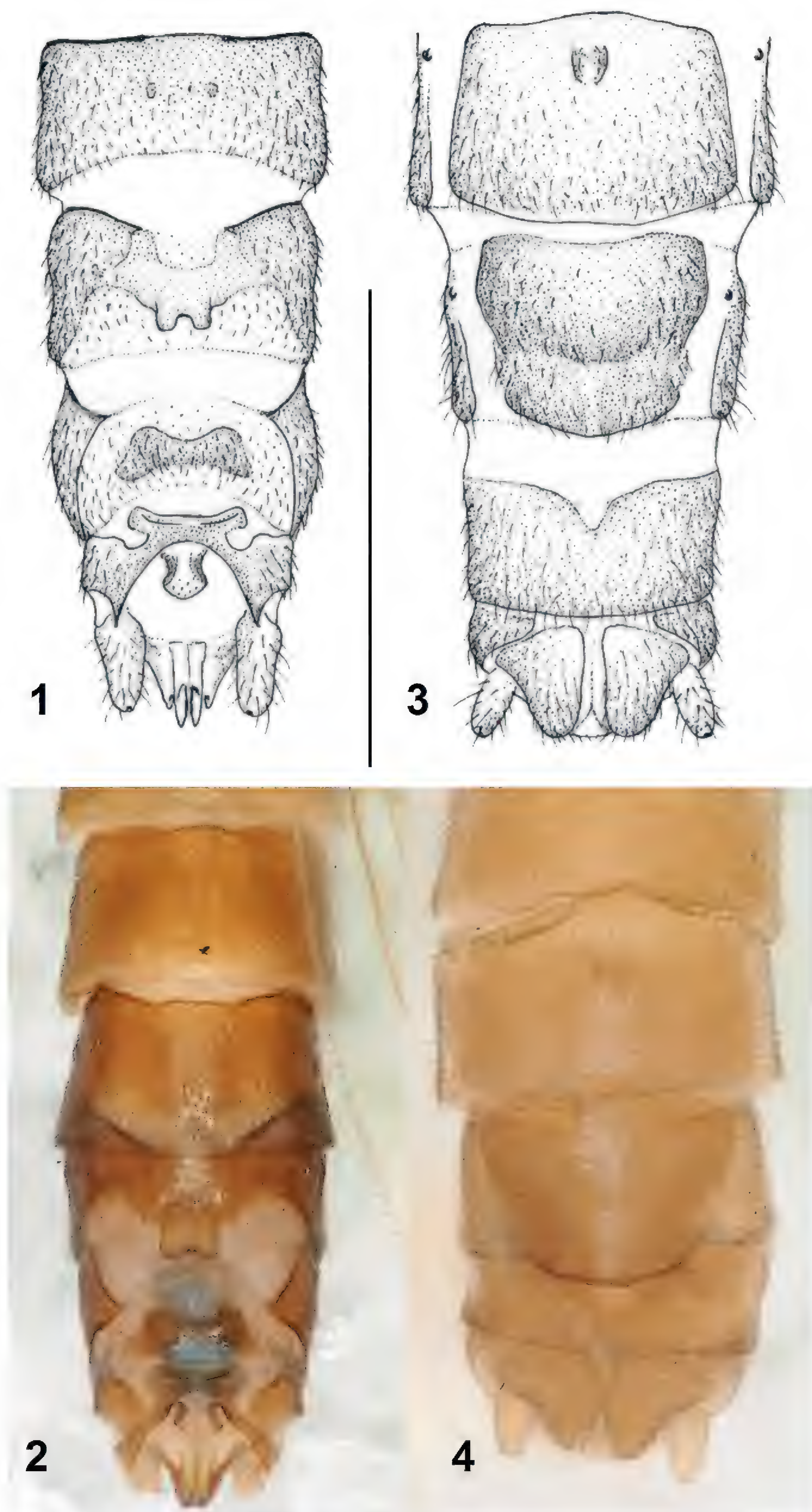
Leuctra carpathica Kis, 1966

Figs 5–8

Material. NMP: UKRAINE: “Worochteńsky, 7.09.1908” [Vorokhtenskyi stream], CHOR (JD), 3♂♂ [as *L. signifera* Kny, det. Klapálek; one terminalia KOH boiled, pinned beneath the specimen in microvial]; “Pożyżewska, 9.09.1908”, CHOR (JD), 1♂ [as *L. signifera* Kny, det. Klapálek; terminalia KOH boiled, pinned beneath the specimen in microvial].

Diagnosis. Male tergum VIII with small median process having long but closely set digits; tergum IX median sclerite less widened and with deep medial subdivision; tergum X lack posterior process by the posteromedial hollow. Female subgenital plate with posterior lobes divided but set close, posterior margin rounded; sternum IX with deep, U-shaped anteromedial hollow.

Remarks. The species was described from the Southern and Inner Eastern Carpathians of Romania (Kis 1966), previously confused with *L. signifera* (Bogoesco & Tabacaru 1960). Subsequently, it was reported from several further Carpathian localities in Romania (Kis 1974) but still lacking from the Transylvanian Alps (Murányi & Kovács 2015). Its presence in the Ukrainian Carpathians was first reported by Zhiltzova (1977). The species seems to be lacking from the Northern Carpathians but present in the extreme northwestern ranges of the Eastern Carpathians in Hungary (Andrikovics & Murányi 2001), Poland (Sowa 1970) and Slovakia (Žiak 2016). Report from the Eastern Alps (Graf & Weinzierl 1999) refers to another species of not yet resolved identity (W. Graf pers. com.; Murányi 2006), whereas report from Montenegro (Kačanski & Baumann 1981) probably refers to the Dinaric *L. jahorinensis* Kačanski, 1972 or *L. malcor* Murányi, 2007 (Murányi 2007, 2008). The present Ukrainian specimens of the NMP originally identified as



Figs 1–4. Terminalia of *Leuctra autumnalis* Aubert, 1948. **1.** ♂, Ukraine [Turkul Mt., Chornohora Range]. **2.** ♂, Austria [St. Oswald]. **3.** ♀, Ukraine [Pozhyzhevska Mt., Chornohora Range]. **4.** ♀, Austria [St. Oswald]. The specimens are deposited in NMP and HNHN collections. Scale bar: 1 mm.

L. signifera by F. Klapálek (based on the handwrite of the det. label); the specimens from Vorokhta village were reported by Dziędzielewicz (1918) as “*L. signifera* Kemp”.

Leuctra major Brinck, 1949

Material. ISEA: UKRAINE: “31/7 Zall.”, “87/1” (CU), 1♀; POLAND: “Tatry 8/2”, “147/10”, T (JD), 1♂ [both specimens were located in the box near label: “cylindrical. DeGe” & “major Brinck”].

Remarks. This species mentioned from Tatry Mts. (Zakopane) and Krzeszowice in Poland, and Ivano-Frankivska Region (Ukraine) as “*Leuctra cylindrica*. De Geer” by Dziędzielewicz (1891).

Leuctra spp.

(damaged and incomplete specimens)

Material. ISEA: UKRAINE: “Tartarów. Chomiak. 15.7.1903”, GOR (JD), 1♂; “9.VII.1904. Chomiak. Mikuliczyn”, “125/19”, GOR (JD), 1♀; “Kolomyja. 17. XI. 1900”, “78/14”, CCA (JD), 1♀; “Mykietyńce. Stanisławów”, “86/1”, CCA (JD); 1♂; “20.VII.1909. Chomiak Mikuliczyn”, “125/15”, GOR (JD), 2♂♂; “(Chomiak) Mikuliczyn. 9.VII.1904”, “125/19”, GOR (JD), 4♀♀; “(Gorgan Bor.). Mikuliczyn. 13. VII.1904”, “127/19”, GOR (JD), 1♂; “Worochta. Okolice. 24.10.1909. na śniegu.”, “134/24” [probably *Leuctra fusca* (Linnaeus, 1758)], CHOR (JD), 1♂; “Worochta. Okolice. 27.10.1908”, “134/24”, CHOR (JD), 2♂♂; “8/5 Kl.”, “115/5”, CCA (JD), 2♀♀; “Ag”, “22/3”, CCA (JD), 2♂♂; POLAND: “Rytro”, “30/13”, SAB (FS), 2♀♀; “Rytro”, “30/13”, SAB (FS), 2♂♂; “Rytro”, “30/13”, SAB (FS), 1♂; “Rytro”, “29/15”, SAB (FS), 1♂; “Babia Góra. Zawoja. 3.VIII.1909”, T (JD), 1♂; “27/7, Zall”, “88/1” (CU), 1♀; “Myślenice. 13. VIII. 1909”, “131/24”, MAP (JD), 1♂; “19/8 Zak.”, “87/1”, T (CU), 1♂; *others*: “116/5” (CU), 3♀♀.

Family **Capniidae** Klapálek, 1905

Genus *Capnia* Pictet, 1841

Capnia nigra (Pictet, 1833)

Material. SMNH: UKRAINE: “Kolomyja 4. Prut.”, CCA (JD), 1♂, 1♀.

Remarks. Some specimens that previously were identified as *C. nigra* (Godunko & Kłonowska-Olejniki 2003), belong to *Capnia vidua* Klapálek, 1904, namely all material reported from the Chornohora Mts.

Capnia vidua Klapálek, 1904

Material. SMNH: UKRAINE: “Foreszczynka. 15.III.1909. Czarnohora.”, CHOR (JD), 1♂; “Czarnohora. Foreszczynka. 1.IV.1910.”, CHOR (JD), 7♂♂, 2♀♀;

“Czarnohora. Foreszczynka. 1.IV.1910.”, CHOR (JD), 2♂♂; “Czarnohora. Foreszczynka. 1.IV.1910.”, CHOR (JD), 1♀?; “Chomiak. Błotek. 26.V.1909”, GOR (JD), 1♀, [this specimen was identified as *Capnia atra* Morton, 1896 by Godunko & Kłonowska-Olejniki (2003)]; “Kolomyja 3.4 Prut”, CCA (JD), 1♂.

Remarks. Four additional specimens from SMNH collection reported as *C. vidua* by Godunko & Kłonowska-Olejniki (2003) in fact are damaged representatives of the order Raphidioptera labeled as: 1♂: “3/8 Woł.”, “3б. Верхрац.”, GP (JW); 1♂: “10.V.52.”, “Брюховичи”, ROZ (VL); 1♂: “Підлюте Кузьминець 15.VI.08. coll. Лазорко”, GR (VL).

Family **Perlidae** Latreille, 1802

Genus *Agnatina* Klapálek, 1907

Agnatina elegantula (Klapálek, 1905)

Material. SMNH: POLAND: “Kraków. Wisła. VIII.”, MAP (? KJ), 1♀.

Remarks. A single specimen from SMNH collection was wrongly identified as *Marthamea vitripennis* (Burmeister, 1839) and published in Dziędzielewicz (1918); no any records for Ukraine.

Genus *Dinocras* Klapálek, 1907

Dinocras megacephala (Klapálek, 1907)

Material. NMP: UKRAINE: “Worochta, 06.1911” [*Vorokhta village*], leg. Lokay, det. I. Sivec 1999, CHOR, 1♂ [as *P. marginata*, det. Klapálek?; lacks terminalia].

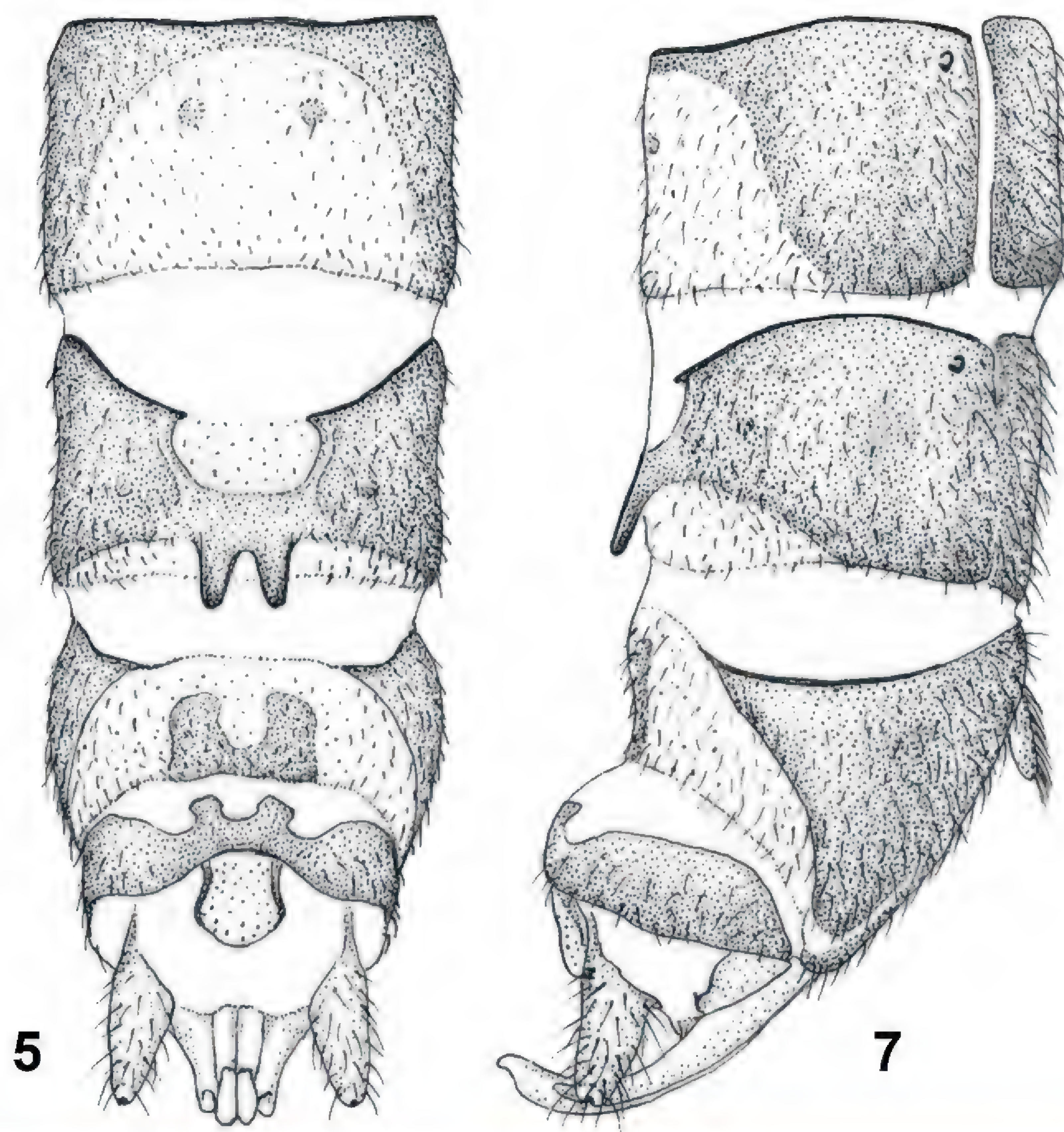
ISEA: UKRAINE: “26/5 Kl”, “138/4”, CCA (JD), 1♀.

Remarks. There were no published mentions about the presence of *D. megacephala* in old collections and contributions. In 2010–2014 we sampled larvae in the Chorna Tysa River near Rakhiv town and the exuviae in the Bystrycja Nadvirnyanska River near Maksymets village that were similar to *D. megacephala* by the description (Diakiv 2010). However, for confirmation of these records, the adults should have been collected. The present determination of male and female from both collections listed above is a first reliable record of *D. megacephala* from the Ukrainian Carpathians and Ukraine at all. Additionally, it was found in Poland for the Tatry, Pieniny, Bieszczady and Kotlina Nowotarska Mts. (Fiałkowski & Kittel 2002).

Genus *Perla* Geoffroy, 1762

Perla abdominalis Burmeister, 1839

Material. NMP: UKRAINE: “Worochta, Rebrowacz” [*Vorokhta village, Rebrovach Mt.*], leg. A. Stoeckel, 1♂;



Figs 5–8. Terminalia of *Leuctra carpathica* Kis, 1966. **5.** ♂, Ukraine [Pozhyzhevskaya Mt., Chornohora Range]. **6.** ♂, Romania [Tusa]. **7.** ♂, Ukraine [Pozhyzhevskaya Mt., Chornohora Range], lateral view. **8.** ♀, Romania [Tusa]. The specimens are deposited in NMP and HNHN collections. Scale bar: 1 mm.

“Worochta” [*Vorokhta village*], leg. A. Stoeckel, CHOR, 1♂.

SMNH: UKRAINE: “Kołomyja 16.V.1899.”, CCA (JD), 1♀; “Kołomyja. 19.V.99.”, CCA (JD), 1♂; “17.-6.-1907 Worochta.”, “K-628 III-945”, “*Perla abdominalis*”, CHOR (JD), 1♂; “Kołomyja. Prut. 30.-V.”, CCA (JD), 2♀♀; “Kniaźdwór. 31.V.”, CCA (JD), 1♂; “Kołomyja. Pryt. 4.VI.”, CCA (JD), 1♂.

ISEA: UKRAINE: “Kołomyja, maj”, “128/10”, CCA (JD), 1♂; “5/5 Kł” “143/4”, CCA (JD), 1♂; POLAND: “Rytro” “25/13”, SAB (FS), 1♀.

Remarks. Godunko & Kłonowska-Olejniki (2003) reported this species for SMNH collection under the synonymic name *P. burmeisteriana* Claassen, 1936. The specimen from the Tatry Mts. were reported by Dziędzielewicz (1918); detailed records from the Polish Carpathians listed by Fiałkowski & Kittel (2002).

Perla bipunctata Pictet, 1833

Material. ISEA: UKRAINE: “Mikuliczyn 5.9.1903”, “83/20”, GOR (JD), 1♀; “Mikuliczyn 5-10.VIII 1904”, “116/19”, GOR (JD), 1♀; “25/5 Mł.”, “143/4”, CCA (JD), 1♀; “31/5 Słobidka leśna”, “36/7”, CCA (JD), 1♀; POLAND: “Babia góra Zawoja” “153/29”, “*Perla alpicola*, Klap.”, T (JD), 1♂; “Babia góra Zawoja 23.VIII.1909” “153/29”, “*Perla alpicola*, Klap.”, T (JD), 1♂.

Remarks. There are no mentions about *P. bipunctata* at the territory of the Ukrainian or Polish Carpathians till 1935 (Despax 1935). However, there are specimens of *P. bipunctata* from the Ciscarpathians, Gorgany Range and Tatry Mts. in ISEA collection. At the previous examination of SMNH collection one specimen was identified as *Perla* sp. (Godunko & Kłonowska-Olejniki 2003).

Perla grandis Rambur, 1842

Material. SMNH: POLAND: “Babia Góra Zawoja. 23.VII.1909.”, T (JD), 1♂.

Remarks. From the Ukrainian part of the Carpathians the species known only from the Tysa river-basin (Kovács et al. 2008a, 2008b). In Polish Carpathians that was found also in the Bieszczady and Western Beskid Mts. (Fiałkowski & Kittel 2002).

Perla marginata (Panzer, 1799)

Material. NMP: UKRAINE: “Worochta, VI.1911” [*Vorokhta village*], leg. Lokay, det. F. Klapálek, vid. I. Sivec 1999, CHOR, 10♂♂, 2♀♀, [one male has a label: *P. barcinonensis*, det. Klapálek].

SMNH: UKRAINE: “Kołomyja 16.V.1899.”, CCA (JD), 1♀; “Mikuliczyn 3.7. Żeniec 1903”, GOR (JD), 1♀; “Tartarów. 6.7 Chomiak 1903”, GOR (JD), 1♂; “Tartarów. (Błotek.) 28.-6.-1905. Dz.”, GOR (JD), 1♂; “Mikuliczyn. (Okolice) 11.-7.-1906.”, GOR (JD), 1♂; “Ko-

łomyja. 4.-VII.”, CCA (JD); 1♂: “Lanczyn. Prut. 8.VI.”, CCA (JD), 1♂; “Kołomyja. 6.VII.”, “*Perla maxima*, Scop.”, “3”, CCA (JD), 1♂; “Kołomyja. Prut. 13.-VII.”, “1”, CCA (JD), 1♀; “Kołomyja. Prut. 15-20.-VII.”, “6.”, “*Perla maxima*, Scop.”, “2”, CCA (JD), 1♀; “Mikuliczyn Żeniec. 20.VII.”, GOR (JD), 1♂; “Mikuliczyn okolice. VIII”, GOR (JD), 2♂♂; “Mikuliczyn okolice”, GOR (JD), 1♂; “Pрут”, CU, (JD), 1 larval skin; POLAND: “Tatry. 1891”, T (JD), 1♂; “Tatry”, T (JD), 1♂; “Tatry. VII. VIII.”, T (JD), 1♂; 2 larval skins, 1♀, all without labels.

ISEA: UKRAINE: “Ag”, “19/3”, CCA (JD), 1♂; “11/7 Dora.”, “37/7”, CCA (JD), 1♂; “5/8. Mł.”, “105/5”, CCA (JD), 3♂♂; “29/9 Młodziatyn (Kołomyjskie)”, “38/7”, CCA (JD), 1♂: [all listed above specimens earlier were identified as “*Dinocras cephalotes*” with respective label in the entomological box]; POLAND: “Myślenice, Stróża 18 VIII 1909”, “151/24”, “*Perla marginata* Panz.”, MAP (JD), 2♂♂; “Rytro”, “25/13”, SAB (FS), 1♀; *others*: “20/7 Kleń” [the origin of the acronym is unknown], “75/14” (CU), 1♀; “8/9 Wr.”, “141/4”, CCA (CU), 2♂♂; “142/4”, (CU), 1♂; “77/14”, (CU), 1♂.

Remarks. According to Sivec & Stark (2002), *P. marginata* is a West European species and does not occur East of the Alps. The Ukrainian specimens in the NMP are conspecific with the taxon depicted as *P. marginata* by Kis (1974) from Romania, to confirm their identity needs further studies. Some specimens of *P. marginata* were identified previously as *D. cephalotes* (Curtis, 1827) by Godunko & Kłonowska-Olejniki (2003). We also identified the specimen from Małopolska Region [Myślenice]. *Perla marginata* is reported to be widespread all over the Carpathians (Kis 1974; Teslenko & Zhiltzova 2009; Źiak 2016).

Perla pallida Guérin-Ménéville, 1943 ‘Type 2’ sensu Sivec & Stark 2002

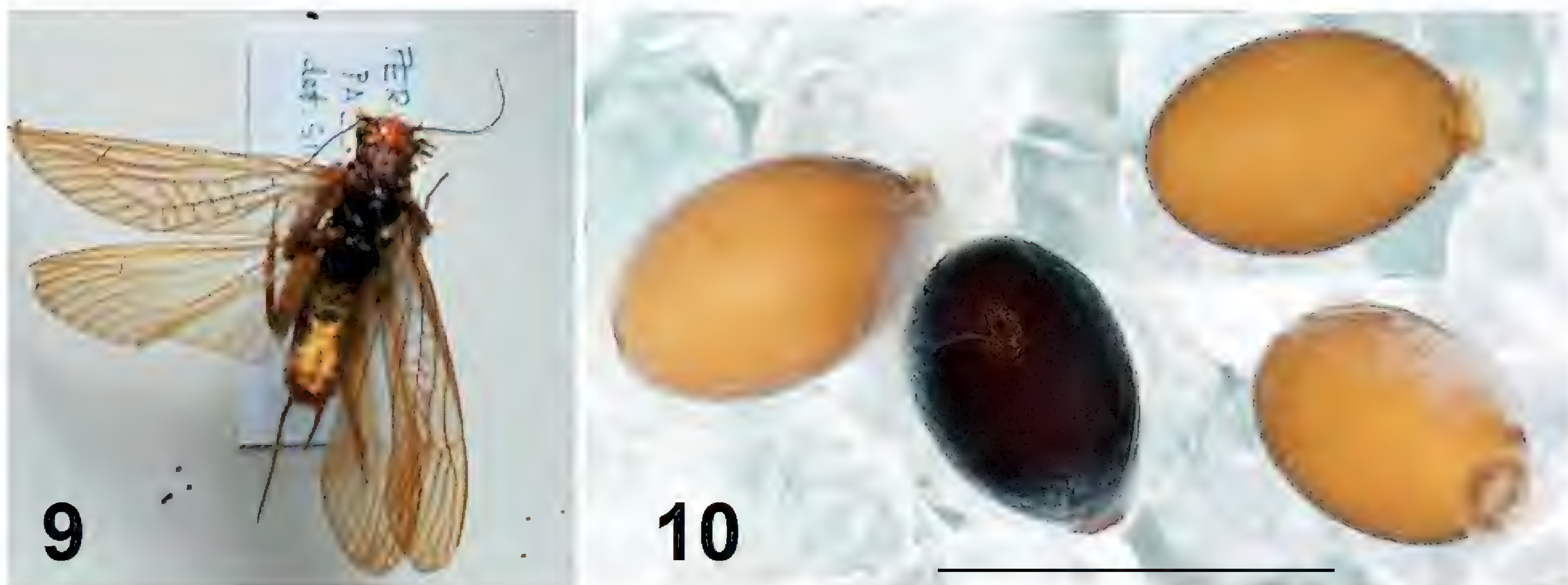
Figs 9–10

Material. NMP: UKRAINE: “Worochta, 06.1911” [*Vorokhta village*], leg. Lokay, det. I. Sivec 1999, CHOR, 1♀ [as *P. marginata*, det. Klapálek]; “Worochta, 8.09.1908”, JD, CHOR, 1♂ [as *P. dacica*, det. Klapálek].

SMNH: UKRAINE: “Chomiak. Błotek. 19.-6.-1907.”, GOR (JD), 1♂; “Worochta. Okolice. 1.-8.-1907”, “*Perla dacica*, Klap.! Det. Klapalek.”, CHOR (JD), 1♂; “Mikuliczyn (Prut) 6.VIII.1909.”, GOR (JD), 1♀.

ISEA: POLAND: “Mikuliczyn 10.7.1903”, “116/19”, GOR (JD), 1♀.

Remarks. The presence of *P. pallida* in the Carpathians was first reported by the description of *P. dacica* Klapálek, 1907 from Romania. Later this taxon was regarded as a subspecies (Kis 1963a), then a synonym of *P. pallida* (Kis 1974). In Ukraine, the species was first reported by Dziędzielewicz (1918), probably on the basis of the NMP specimens. During the latest revision of the genus, *P. pallida* was treated as a species complex



Figs 9–10. *Perla pallida* Guérin-Méneville, 1943 ‘Type 2’ sensu Sivec & Stark 2002, ♀, Ukraine [Vorokhta]. **9.** Habitus of the specimen in NMP collection. **10.** Dissected eggs. Fig. 9 without scale. Scale bar: 10 = 0.5 mm.

with four ‘Types’ distinguished on the basis of egg morphology (Sivec & Stark 2002). The Carpathian populations were first studied on the basis of eggs from Maramureș, Romania, confirming the presence of ‘Type 2’ (Murányi 2006). Herein we confirm the same ‘Type 2’ from Ukraine, having eggs with distinct hexagonal FCIs and collar made up of two narrow rows (Fig. 10). *Perla pallida* is widespread all over the Carpathians.

***Perla* spp.**

(damaged and incomplete specimens)

Materials. ISEA: UKRAINE: “5/8 Mł.”, “102/5”, CCA (JD), 1♀; “Mykielyńce Stanisławów”, “73/1”, CCA (CU), 1♀; “13/6 Kł”, “101/5”, CCA (JD), 1♀; “15. VIII.1904, Mikuliczyn”, “118/19”, GOR (JD), 1♂; “9/7 Mik.”, “104/5”, GOR (JD), 1♂; “Swidowa. Czortkow. Kiel.”, “39/7”, CCA (JD), 1♀; *others*: “139/4” (JD), 1 exuvium; “76/14” (CU), 1♂;

Family **Perlodidae** Klapálek, 1909

Genus ***Arcynopteryx*** Klapálek, 1904

Arcynopteryx dichroa (McLachlan, 1872)

=*Arcynopteryx carpathica* Klapálek, 1906

Figs 11–13

Materials. NMP: UKRAINE: “Chomiak, pot. Barani, 6.07.1905” [*Khomyak Mt., Baranii stream*], det. F. Klapálek, GOR (JD), 1♂, 2♀♀ [the male was labelled as lectotype and the females as paralectotypes by P. Zwick in 1980 without further designation according to the requirements of the International Code of Zoological Nomenclature (ICZN); male terminalia cleared, pinned beneath the specimen in microvial, one female have only the wings remained]; “Chomiak, pot. Barani, 26.06.1905”, det. F. Klapálek, GOR (JD), 2♂♂, 1♀ [labelled as paralectotypes by P. Zwick in 1980 without further designa-

tion according to the requirements of ICZN; one male terminalia cleared, pinned beneath the specimen in microvial]; “Chomiak, Blotek, 9.07.1904”, det. F. Klapálek, GOR (JD), 1♀ [wrongly labelled as paralectotype by P. Zwick in 1980; not belongs to syntype series according to the requirements of ICZN]; “Chomiak, 27.06”, det. F. Klapálek, GOR (JD), 1♂, 1♀ [both lacks abdomen]; “Worochta, potok nad Rebrowaczem”, 25.06.1908” [*Vorokhta village, stream up to Rebrovach Mt.*], det. F. Klapálek, GOR (JD), 1♀; “Worochta, 06.1911”, leg. Lolkay, det. F. Klapálek, GOR (JD), 1♂, 1♀; “Worochta”, leg. Stoeckel, det. F. Klapálek, GOR (JD), 5♂♂.

SMNH: UKRAINE: “Danzerz. 20. VII – 1906. źródła przy drodze.”, CHOR (JD), 1♂; “Worochta. Okolice. p. pod. Rebrow. 25.-6.-1907.”, CHOR (JD), 1♀; “Czarnohora. Kozły. 8.-7.-1907.”, CHOR (JD), 1♂; “Worochta. Okolice. 30.-7.-1907.”, CHOR (JD), 1♀; Worochta. Okolice. pot. z Rebrow. 15.-6.-1908.”, CHOR (JD), 1♀; “Chomiak [Blotek] 5.VI 1909”, GOR (JD), 1♂; “Tatry. 1892. Dziędz.”, “dovrensis Klapálek”, T (JD), 3♂♂.

ISEA: UKRAINE: “Chomiak. pot. Barani. 26.-6.-1905. Dz.”, “82/20”, GOR (JD), 2♂♂ [both labelled as paralectotypes by Kh.I. Arkhipova & R.J. Godunko in October, 2019].

Remarks. *Arcynopteryx carpathica* is the fourth oldest name presently classified as a junior synonym of *A. dichroa* (DeWalt et al. 2018). The synonymy under *A. compacta* (McLachlan, 1872) was stated by Brinck (1949), and inherited to *A. dichroa* when Teslenko (2012) clarified the misunderstanding in the using of the two names. In the present contribution we accepted synonymy of *A. dichroa* and *A. carpathica* established by DeWalt et al. (2018). In a previous contribution on SMNH collection (Godunko & Kłonowska-Olejnik 2003) *A. dichroa* was mentioned under the synonymic name *A. compacta* (for more details see Teslenko 2012).

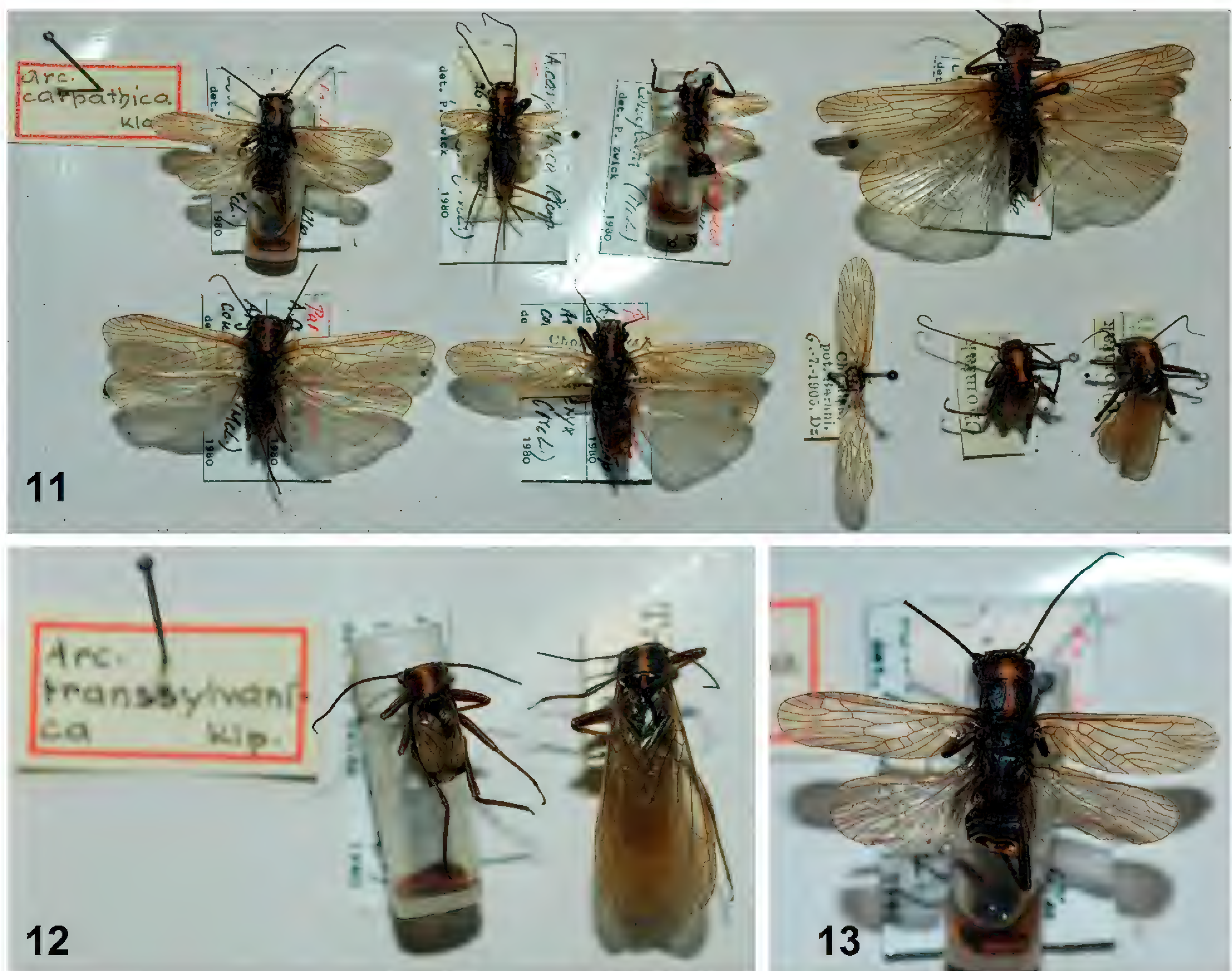
In 1980 Peter Zwick investigated the collection of František Klapálek housed in NMP. The specimens of

A. carpathica were selected, and part of them belonging to the type series [syntypes according to ICZN, Article 73.2.] were labelled as lectotype and paralectotypes, without further designation according to the requirements of ICZN. Later, Zwick (1982) published designation of types for several species of the family Nemouridae only, and mention of the specimen labelled as the lectotype of *A. compacta* is lacking in his paper.

The quantity of syntype specimens were not reported in the original description. However, Klapálek (1906) mentioned many males and females. In addition to the NMP collection, two males discovered in ISEA also belong to the type series and present paralectotypes according to Article 74.1.3. of the ICZN (see also below). At the same time, 1♂ and 3♀♀ of *A. carpathica* listed by Sartori et al. (1990) from the Musée de Zoologie, Lausanne as paratypes and labelled as “Tchécoslovaquie, Carpates, Chomiak, Barani, 3-4.VII. 1905. Dziedziedlewicz leg. A sec. Ex coll. Klapalek!” are not syntypes, because the

date of material sampling does not match the information in the original description [see ICZN, Articles 73.2., 74].

Extensive molecular studies on the Holarctic *A. dichroa* suggested strong population differentiation between mountain ranges (Theissinger et al. 2012). Further investigations may result in reinstatement of some of the fifteen names treated as junior synonyms of *A. dichroa*. For the Carpathian and Bulgarian populations that were included in one lineage during the studies of Theissinger et al. (2012), there are two available names: *A. carpathica* and the older *Dictyopteryx transsylvanica* Klapálek, 1901. There are 1♂ and 1♀ syntypes available also of the latter in the NMP (ROMANIA, Transylvania, leg. Strobl; according to the original description, they were collected at the Iezer Lake, Rodna Mts. on 27.07.1896). Thought it would be useless to illustrate genital characters without knowledge on distinctive features that may separate these presently cryptic species, herein we include figures on



Figs 11–13. Type series of the Carpathian *Arcynopteryx* Klapálek, 1904. **11.** *A. carpathica* Klapálek, 1906, lectotype and paralectotypes. **12.** *Dictyopteryx transsylvanica* Klapálek, 1901, syntypes. **13.** *A. carpathica* Klapálek, 1906, lectotype. The specimens are deposited in NMP collection [entomological box]. Without scales.

the habitus of the type series due to recognition of the available types (Figs 11–13).

Thus, in order to preserve stability of nomenclature in the future we designate the lectotype and paralectotypes of *A. carpathica* herein [ICZN, Article 74], using syntype series housed in NMP and ISEA [according to ICZN, Article 73.2.].

Lectotype [ICZN, Article 74, Recommendations 73C, 74C, 74D]: 1♂ labelled as “Chomiak, pot. Barani, 6.07.1905”; coll. J. Dziędzielewicz; det. F. Klapálek, housed in the collection of the National Museum in Prague (Figs 11, 13).

Type locality [ICZN, Articles 74 and 76.2., Recommendation 74E]: UKRAINE, Ivano-Frankivsk Region, Gorgany Range, Khomyak Mt, Baranii stream.

Paralectotypes [ICZN, Article 74, Recommendation 74F]: 2♂♂, 1♀ labelled as “Chomiak, pot. Barani, 26.06.1905”; 2♀♀ labelled as “Chomiak, pot. Barani, 6.07.1905” (all specimens in collection of NMP); 2♂♂ labelled as “Chomiak. pot. Barani. 26.-6.-1905. Dz.”, “82/20” (both specimens in collection of ISEA).

Remarks. *Arcynopteryx dichroa* is a Holarctic species that is known from all the river-basins of the Ukrainian Carpathians in Chornohora, Gorgany and Rivna Ranges and in Poland from the Western Beskid Range, Bieszczady Ranges and Tatry Mts. (Dziędzielewicz 1918; Despax 1933; Zhiltzova 1966, 1968; Fiałkowski & Kittel 2002).

Genus *Diura* Billberg, 1820

Diura bicaudata (Linnaeus, 1758)

Material. ISEA: UKRAINE: “Chomiak. Pot. Barani. 26.-6.-1905. Dz.”, “82/20”, GOR (JD), 2♂♂; “Chomiak, pot. Barani. 26.6.1905. Dz.”, GOR (JD), 1♂; POLAND: “Babia Góra. Zawoja. 27.VII.1909”, “154/24”, T (JD), 1♂; “1891. Tatry”, “125/10”, T (JD), 1♂; “Tatry.8/2”, “125/10”, T (JD), 2♂♂ [three last specimens were located in the entomological box under label “*Dictyogenus Klap. alpinus* Pict.”].

Remarks. *Diura bicaudata* is mentioned from the Tatry Mts. in old publications as “*Dictyopterygella Klap.*”, that were collected by F. Klapálek in 1904 (see e.g. Dziędzielewicz, 1918). Additionally, there are also specimens from the Gorgany Range within the Ukrainian Carpathians. The species was also found in the Nesamovyte Lake (Chornochora Range) (Diakiv 2011). In Poland it was found also in the Western Sudety, Western Beskid and Bieszczady Ranges (Fiałkowski & Kittel 2002).

Genus *Isogenus* Newman, 1833

Isogenus nubecula Newman, 1833

Material. SMNH: UKRAINE: “Jaryszów. Gub. Podolska. 30.IV. zeb P. hr. Dzieduszycki”, WPOD (PD), 1♂; “Wertelka pod Zahoice. 26.V.”, (JF), 1♂.

ISEA: UKRAINE: “12/5 Lancorona”, “137/4”, BM (JF), 1♂; “Kołomyja”, “127/10”, CCA (JD), 1♀; *others*: “21/9”, (CU), 1♂; (CU), 1♂.

Remarks. There were only two specimens in the collection of SMNH from the Western Podillya (Khmelnyska Region) mentioned by Dziędzielewicz (1918). During the revision it was identified also in the collection of ISEA from the Beskid Makowski Range and from Kolomyia town. The last one site was mentioned by Dziędzielewicz (1918). The species seems to be extinct in Western and Central Europe from the second half of the XX century, but there are some frequent finds in Eastern Europe (Fochetti & Tierno de Figueroa 2006). That is why *I. nubecula* belongs to the category EN [*endangered*] in the Carpathian Red List (Pawłowski 2003). In 2006 *I. nubecula* was found for the first time for the Transcarpathians in Ukraine from the Tysa, Teresva and Rika rivers (Kovács et al. 2008b; larval records).

Genus *Perlodes* Banks, 1903

Perlodes intricatus (Pictet, 1841)

Material. SMNH: UKRAINE: “Poturzyca przy Bugu”, “Klapálek angusticeps”, LP (JD), 1♀.

ISEA: UKRAINE: “Chomiak. Pot. Bogdan. 14.-7.-1905. Dz.”, “80/”, GOR (JD), 1♀; “Kołomyja”, “127/10”, CCA (JD), 1♀; “25/4 Kł.”, “134/4”, CCA (JD), 1♂; POLAND: “Kościel.VIII”, “72/1”, T (JD), 1♀; “Kościelisko. Tatr. 1891. Dziendz.”, “124/10”, T (JD), 1♀; “Kościelisko”, “124/10”, T (JD), 1♀; “Rytro” “24/13”, SAB (FS), 2♀♀; “Rytro”, “24/”, SAB (FS), 1♀; “Wad” “71/1”, PS (CU), 1♀; *others*: “24/13”, SAB (FS), 1♀; “72/1” (JD), 1♀.

Remarks. In the paper published by Godunko & Kłowska-Olejniak (2003), material from SMNH is mentioned as *Perlodes intricata* (Pictet, 1841).

The specimen mentioned as *Perlodes dispar* (Rambur, 1842) in the previous contribution on SMNH collection (Godunko & Kłowska-Olejniak 2003) belongs to *P. intricatus*. That was the single specimen, mentioned by Dziędzielewicz (1918) as *P. dispar*. We have identified further specimens from Kościelisko [village in Małopolska Province], although there was no mention about findings of *P. intricatus* from the Tatry Mts. in J. Dziędzielewicz' papers. In the Ukrainian Carpathians, besides the Chornohora Range, *P. intricatus* is recently reported from the Gorgany Range (Diakiv 2011).

Perlodes microcephalus (Pictet, 1833)

Material. SMNH: UKRAINE: “Chomiak. pot. Bogdan. 11.-7.-1905. Dz.”, “♀”, GOR (JD), 1♀; “Chomiak. pot. Barani. 10.-6.-1907.”, GOR (JD), 1♀; “Chomiak. Błotek. 1.VI.1909.”, “*Perlodes (Dictyopteryx) microcephala* Pict.”, GOR (JD), 1♀; “Kołomyja. 30.V.”, CCA (JD), 1♀; “Kołomyja. Prut.”, CCA (JD), 1♂.

ISEA: UKRAINE: “Chomiak. pot. Bogdan. 18.-7.-1905. Dz.”, “80/20”, GOR (JD), 1♀; “Chomiak. pot. Bogdan. 5.-7.-1905. Dz.”, “80/20”, GOR (JD), 1♀; “Chomiak. pot. Barani. 26.-6.-1905. Dz.”, “80/20”, GOR (JD), 1♂; “2/4 Kł” “133/4”, CCA (JD), 1♂; “8/5 Kł”, “100/5”, CCA (JD), 1♂; “3/6 Mł.”, “99/5”, CCA (JD), 1♀; POLAND: “Myślenice. Stanisławów”, “70/1”, MAP (JD), 4♀♀; *others*: “98/5” (CU) 2♂♂; “133/4”, CCA (JD), 2♀♀; “133/4, CCA” (JD), 3♂♂.

Remarks. There were determined specimens of *P. microcephalus* from ISEA collection. The findings belong to the region of Gorgany and Ciscarpathians as those in the Ukrainian part of the collection. By the latter investigations, *P. microcephalus* was found in the Ukrainian Beskydy (Diakiv 2011) and in most of the Polish Carpathians (Fiałkowski & Kittel 2002).

Genus *Isoperla* Banks, 1906

Isoperla grammatica (Poda, 1761)

Material. SMNH: UKRAINE: “Mikuliczyn. Polanica 5.VIII.1888”, GOR (JD), 1♀; “Kołomyja 12.V.1899.”, CCA (JD), 1♂; “Tatarów. (Błotek.) 10.-7.-1905. Dz.”, GOR (JD), 1♂; “Mikuliczyn (Żeniec) 23.VII”, GOR (JD), 1♀; “Mikuliczyn (Żeniec).”, GOR (JD), 1♀; “Kołomyja Prut.”, CCA (JD), 3♀♀; “Kołomyja”, CCA (JD), 1♂; “Kołomyja. 30.V.”, CCA (JD), 1♂, 1♀; “Kołomyja. 5.VI.”, CCA (JD), 1♂; POLAND: “Tatry”, T (JD), 1♂.

ISEA: UKRAINE: “Czarnohora. Dancerz. 12.IX.1909”, “139/29”, CHOR (JD), 1♀; POLAND: “Myślenice Oklejna. 19.VII.1909”, “166/24”, MAP (JD), 1♂; “Rytro”, “26/15”, SAB (FS), 1♂; *others*: “88/20” (CU), 1♀; “137/10”, (?JD), 1♀; “138/10” (CU), 1♀.

Remarks. There were determined specimens from the Chornohora Range within Ukrainian Carpathians (Diakiv, 2010; 2011). Dziędzielewicz (1918) reported about the presence of *I. grammatica* all over the Carpathians as “*Chloroperla grammatica* Scop.”

Isoperla rivulorum (Pictet, 1841)

Material. SMNH: UKRAINE: “Mikuliczyn. (Żeniec).”, GOR (JD), 1♀; POLAND: “Babia Góra. Zawoja. 23.VII.1909.”, T (JD), 1♂.

Remarks. Earlier *I. rivulorum* was found also in the Prut river-basin (Dziędzielewicz, 1891) and then it was found on the other side of the Chornohora Range, i.e., in

the Keveliv stream (Tysa river-basin) during our investigations (Diakiv 2011). In Poland the species is found in the Western Sudety and Western Beskid Regions (Fiałkowski & Kittel 2002). Due to distributional pattern of this species, which is confirmed for the Alps but scarcely known from Central and Eastern Europe, the question about systematic position of all material mentioned as *I. rivulorum* (e.g., in the Carpathians) should be clarified in the future.

Isoperla sudetica (Kolenati, 1860)

Figs 14–16

Material. HNHM: UKRAINE: Zakarpatska Region, Mizhhirskyi district, Krasna Mts., spring at a forest edge in the upper valley of Kvasovec Stream, 48°22.79' N, 23°42.86' E, 1250 m a.s.l., 21.05.2002, leg. D. Murányi: 1♂.

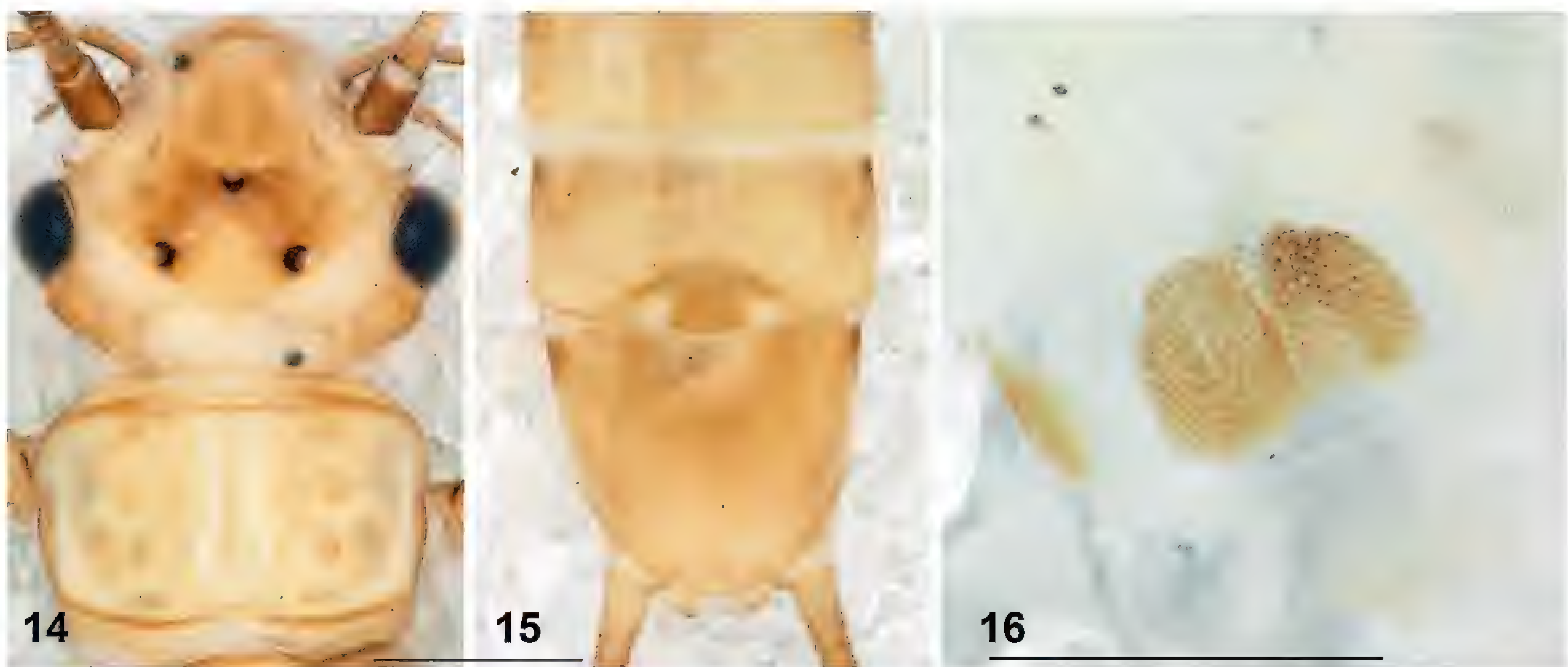
ISEA: POLAND: “1891. Tatry”, “137/10”, T (JD), 1♀.

Diagnosis. General coloration yellowish with dark brown markings; head with horseshoe-shaped dark marking connecting ocelli, pronotum with large rugosities. Vesicle of sternite VIII well developed, wider than long. Both medial and lateral penial armatures with spike-like scales; medial armature weakly notched medially, width and length ratio 1.3.

Remarks. The species was described from the Czech portion of the Eastern Sudetes (Kolenati 1860). Later it was found also in the German and Polish areas of the whole Sudetes (Reusch & Weinzierl 1999; Fiałkowski & Kittel 2002), as well as from several localities in the Czech, Slovak, Polish and Romanian areas of the Carpathians (Kis 1974; Fiałkowski & Kittel 2002; Bojková & Soldán 2013; Žiak 2016).

Isoperla sudetica was reported for the Prut river-basin (Dziędzielewicz 1908). Nevertheless, no other specimens in the collections studied, except the female imago listed above. This specimen was reported from the Tatry Mts. by Dziędzielewicz (1895) as “*Chloroperla sudetica* Kol.”. Additionally, this author expressed some doubts because he couldn't distinguish *I. sudetica* from *I. grammatica* (cited as “*Chloroperla grammatica* Scop.”) because of the taxonomic doubts in that time. In Ukraine, Dziędzielewicz (1918) reported the species from Chomiak Mt. and the Chornohora Range, but no subsequent data were published. The species was included in the latest checklist of the Ukrainian Carpathians (Diakiv 2011), but excluded even from the monograph of the former Soviet Union (Teslenko & Zhiltzova 2009). Occurrence of the species out of the Sudetes and the Carpathians is questionable. The single Alpine data from Austria could not be proved (Graf 1999), and the species was recently reported from southern Serbia, being the single Balkan report of the species (Petrović et al. 2014).

A related, yet unnamed taxon was reported and briefly illustrated from the nearby Igriş Plateau, Maramureş,



Figs 14–16. *Isoperla sudetica* (Kolenati, 1860), ♀ [Poland] and ♂ [Ukraine]. **14.** Head and pronotum. **15.** Male terminalia, ventral view. **16.** Penial armatures. The specimens are deposited in ISEA and HNHM collections. Scale bars: 14–15 = 1mm; 16 = 0.5 mm.

Romania (Murányi 2006). Our Ukrainian specimen morphologically agrees with *I. sudetica* specimens from the Northern Carpathians, and differs from the unnamed taxon from the Igriș by paler coloration, and less widened medial penial armature with width and length ratio below 1.5 (Figs 14–16).

***Isoperla* spp.**

(damaged and incomplete specimens)

Material. ISEA: UKRAINE: “Czarnohora. Danczerz. 12.-IX.1909”, “139/24”, CHOR (JD), 2♂♂; “Tartarów. (Błotek.) 8.-7.-1905. Dz.”, “86/20”, GOR (JD), 1?; “Tartarów. (Błotek.) 29.-6.-1905. Dz.”, “86/20”, GOR (JD), 1?; “Jabłonica za Tartarowem. 18.-7.-1905. Dz.”, “87/20”, CHOR (JD), 1?; “Chomiak. pot. Bogdan. 18.-7.-1905. Dz.”, “85/20”, GOR (JD), 1?; POLAND: “Tatry 8/2”, “137/10”, T (JD), 1?; “1891. Tatry. Dzie”, “137/10”, T (JD), 1?; “dol. Białego.”, “136/10”, T (CU), 1?; “Babia Góra. Zawoja. 25.VII. 1909.”, “138/24”, T (JD), 1?; “Myślenice. Stróże. 18.VII.1909.”, “146/24”, MAP (JD), 1?.

Also there are representatives of Perlodidae spp. that are impossible to identify due to damages:

ISEA: UKRAINE: “Chomiak. pot. Barani. 3.-7.-1905. Dz.” “82/20”, GOR (JD), 1?; “Chomiak. pot. Barani. 26.-6.-1907. Dz.” “82/20”, GOR (JD), 1?; POLAND: “Rytro”, “24/13”, SAB (JD), 1?.

Family **Chloroperlidae** Okamoto, 1912

Genus ***Siphonoperla*** Zwick, 1967

Siphonoperla neglecta (Rostock, 1881)

Material. SMNH: UKRAINE: “Chomiak. (Błotek.) 13.-7.-1905. Dz.”, GOR (JD), 1♂; “9.VII.1904. Chomiak Mikuliczyn”, GOR (JD), 1♀; “Chomiak. [Błotek] 14.VI 1909”, GOR (JD), 2♂♂; “20.7. Żeniec. Mikuliczyn”, GOR (JD), 1♂; “24.7. Mikuliczyn pot. Żeniec”, GOR (JD), 1♂.

ISEA: 1♂: “148/17” (CU).

Remarks. The species was mentioned by Godunko & Kłonowska-Olejniak (2003) from the Prut basin based on investigation the specimens from SMNH collection (see above). Besides the Prut river-basin, *S. neglecta* is also known from Tysa river-basin (Zhiltzova 1968). In the Polish Carpathians, *S. neglecta* is known from the Western Beskid and Tatry Mts. (Fiałkowski & Kittel 2002).

Siphonoperla transsylvanica (Kis, 1963)

Figs 17, 19

Materials. HNHM: UKRAINE: Zakarpatska Region, Tyachivskyi district, Krasna Mts., right tributary of Luzanka River, 48°21.90'N 23°42.60'E, 870 m a.s.l., 22.05.2002, leg. D. Murányi: 1♂, 2♀♀; Mizhhirskyi district, Krasna Mts., Kolochava, Tereblya River above the village, 48°25.35'N 23°41.58'E, 545 m a.s.l., 23.05.2002, leg. D. Murányi: 2♀♀, 1 exuvium.

SMNH: UKRAINE: “20.VII.1909. p. Bogdan ad Chomiak. Mikuliczyn 1909.”, GOR (JD), 1♀; “Słobódka leśna 25.5”, CCA (JD), 1♂; “Słobódka leśna 4.6.”, CCA (JD), 1♂.

Remarks. The species was described from the Romanian Carpathians (Kis 1963b), and soon reported

also from the Eastern Carpathians of Slovakia (Raušer 1964) and Hungary (Újhelyi 1969). Similar to *Leuctra carpathica*, the species seems to be lacking from the Northern Carpathians (Žiak 2016) but is widespread in the Eastern and Southern Carpathians (Kis 1974). Out of the Carpathians, it is known from the Bulgarian parts of the Stara Planina (Braasch & Joost 1971), eastern Bosnia and Herzegovina (Kačanski 1973), eastern and northern Macedonia (Ikononov 1986) and was recently reported from western Serbia (Petrović et al. 2014). Due to morphological similarity and allopatric distribution, *S. transsylvanica* was classified as a subspecies of *S. torrentium* (Pictet, 1841) by Zwick (1971). Later, genetic analyses proved rather high distance between *S. torrentium torrentium* and two of its subspecies, thus *S. transsylvanica* was reinstated as separate species (Weiss et al. 2012).

Siphonoperla transsylvanica had never been reported from Ukraine; however, the vicariant *S. torrentium* was reported several times (Dziędzielewicz 1918; Zhiltzova 1968; Diakiv 2010). Concerning their distribution, and the lack of *S. torrentium* in eastern Slovakia (Žiak 2016) and the whole of Romania (Kis 1974), previous Ukrainian data must rely on *S. transsylvanica*. According to Zwick (1971) and Weiss et al. (2012), morphological distinction of the two taxa relies on the structure of penial scales and length of titillators, while the original description mentioned mostly coloration differences and the shape of the male epiproct (Kis 1963b). Herein we illustrate the color pattern differences between our Ukrainian *S. transsylvanica* specimens and a *S. torrentium torrentium* population from the central Slovakian Poľana Mts. (Hriňová, Slatina Stream): our *S. transsylvanica* specimens lack any dark pattern between the ocelli and the mesosternal furcal pit is pale, while the *S. torrentium* specimens have small dark markings around posterior ocelli and the furcasternal pit is distinct, dark brown (Figs 17–20).

Genus *Xanthoperla* Zwick, 1967

Xanthoperla apicalis (Newman, 1836)

Material. SMNH: UKRAINE: “Kołomyja 25.6.”, CCA (JD) 1♂; “6. Kołomyja”, CCA (JD), 1♂; “Kołomyja w Czerwcu”, CCA (JD), 1♂; “6 Kł.”, CCA (JD), 3♂♂.

Remarks. The specimens listed above are the only ones for the Ukrainian Carpathians from old collections. All investigators just cited Dziędzielewicz (1891, 1883, 1877) and Majewski (1885) records. By the latter investigations it was found in some regions of the Polish Carpathians (Fiałkowski & Kittel 2002). Larvae of *X. apicalis* recently were found in the Beskids of Ukrainian Carpathians (Diakiv 2011).

Chloroperlidae spp.

(damaged and incomplete specimens)

Material. ISEA: UKRAINE: “25/6 Kł.”, “150/4”, CCA (JD), 1♂; “Ag”, “21/3”, CCA (JD), 2♀♀; “Ag”, “21/3”, CCA (JD), 1♂; “Mikuliczyn. 1 do 5. VIII. 1904”, “124/19”, (JD), 1♂; “Tartarów. 1902.31.7”, “146/17” GOR (JD), 1♀; “Tartarów. 1902.26.7. połudn. stoki Chomiaka”, “147/17”, GOR (JD), 1♂; “Tartarów. 15.7. Chomiak. 1903”, “123/19”, GOR (JD), 1♀; “Tartarów. 15.7. Chomiak.”, “123/19”, GOR (JD), 1♀; “połudn. stoki Chomiaka” “147/17”, GOR (JD), 1♂; POLAND: “Wad”, “80/1”, PS (CU), 1♂; “Tatry”, “140/10”, T (JD), 1♂; *others*: “3/7 Dr.?””, “109/5” (CU), 1♂; “8/6 Sł.” “148/4” (CU), 3♂♂; (CU), 1♀.



Figs 17–20. Female adults of *Siphonoperla transsylvanica* (Kis, 1963) and *S. torrentium torrentium* (Pictet, 1841). 17. *S. transsylvanica*, Ukraine [Tereblya], head and pronotum. 18. *S. torrentium torrentium*, Slovakia [Hriňová], head and pronotum. 19. *S. transsylvanica*, Ukraine [Tereblya], meso- and metasternum. 20. *S. torrentium torrentium*, Slovakia [Hriňová], meso- and metasternum. The specimens are deposited in NMP and HNHN collections. Scale bar: 1 mm.

Family **Taeniopterygidae** Klapálek, 1905

Genus **Brachyptera** Newport, 1849

Brachyptera braueri (Klapálek, 1900)

Material. ISEA: POLAND: “Rytro”, “28/13”, SAB (FS), 3♂♂.

Remarks. Dziędzielewicz (1918) reported *B. braueri* only for the Prut River near Kolomyia. The species belongs to the rare taxa in Ukraine and is known for the country only from the beginning of 20th century. In the Polish Carpathians the species is known only from the Western Beskid (Fiałkowski & Kittel 2002).

Brachyptera monilicornis (Pictet, 1841)

Material. ISEA: POLAND: “28/13”, SAB (FS), 1♂.

Remarks. There is no mention about *B. monilicornis* in J. Dziędzielewicz’ papers. In the Ukrainian Carpathians this species is known for the upper part of the Prut river-basin (Diakiv 2011). For Poland, Fiałkowski & Kittel (2002) reported *B. monilicornis* for the Western Sudety and Tatry Mts.

Brachyptera seticornis (Klapálek, 1902)

Material. ISEA: UKRAINE: “23/4 Kł”, “157/4”, CCA (JD), 1♀; “19/3 Kł”, “157/4”, CCA (JD), 2♂♂; “8/5 Kł”, “112/5”, CCA (JD), 1♀ [with ball of eggs on the abdomen]; “Mykietyńce, Stanisławów”, “84/1”, CCA (JD), 1♂; “Tartarów.1902.28.7. pod Chomiakiem”, “151/17”, GOR (JD), 1♀; “Chomiak. pot. Barani. 29.-7.-1905. Dz.”, GOR (JD), 1♀; “145/10”, T (JD), 1♂; “Forzeszczynka. 15. III. 1909. Czarnohora.”, “135/24”, CHOR (JD), 2♂♂; “Czarnohora. Forzeszczynka. 15. III. 1909”, “135/24”, CHOR (JD), 1♂; POLAND: “1891 Tatry”, “145/10”, T (JD), 1♂; “Rytro”, “28/13”, SAB (FS), 1♂; “144/10” (CU), 1♀; “156/4” (CU), 3♂♂; “144/10” (CU), 1♂; “159/4” (CU), 1♀.

Remarks. These specimens of *B. seticornis*, that have been mentioned in the old literature (see e.g. Dziędzielewicz 1908), are confirmed for the collection. It was not mentioned from the Dniester river-basin. In Poland it is known from the Western Sudety and Western Beskid Ranges, and Tatry Mts. (Fiałkowski & Kittel 2002). One of these specimens is preserved with the ball of eggs on the abdomen.

Brachyptera spp.

(damaged and incomplete specimens)

Material. ISEA: UKRAINE: “20/4, Kł”, “157/4”, CCA (JD), 1?; “Mykietyńce, Stanisławów”, “26/3 M”, “84/1”,

CCA (JD), 1?; POLAND: “Krak. 1/4”, “z.” (CU), 1?; others: “144/10” (CU), 1?; “74/8” (CU), 1?.

Remarks. The specimen from “Mykietyńce, Stanisławów” can be *B. trifasciata* as this species was mentioned from this region in papers (Dziędzielewicz 1891). Others specimens could belong to any species of *Brachyptera* genus mentioned by J. Dziędzielewicz, e.g., *B. braueri*, *B. monilicornis*, *B. risi* (Morton, 1896), *B. seticornis* and/or *B. trifasciata*.

Genus **Oemopteryx** Klapálek, 1900

Oemopteryx loewii (Albarda, 1889)

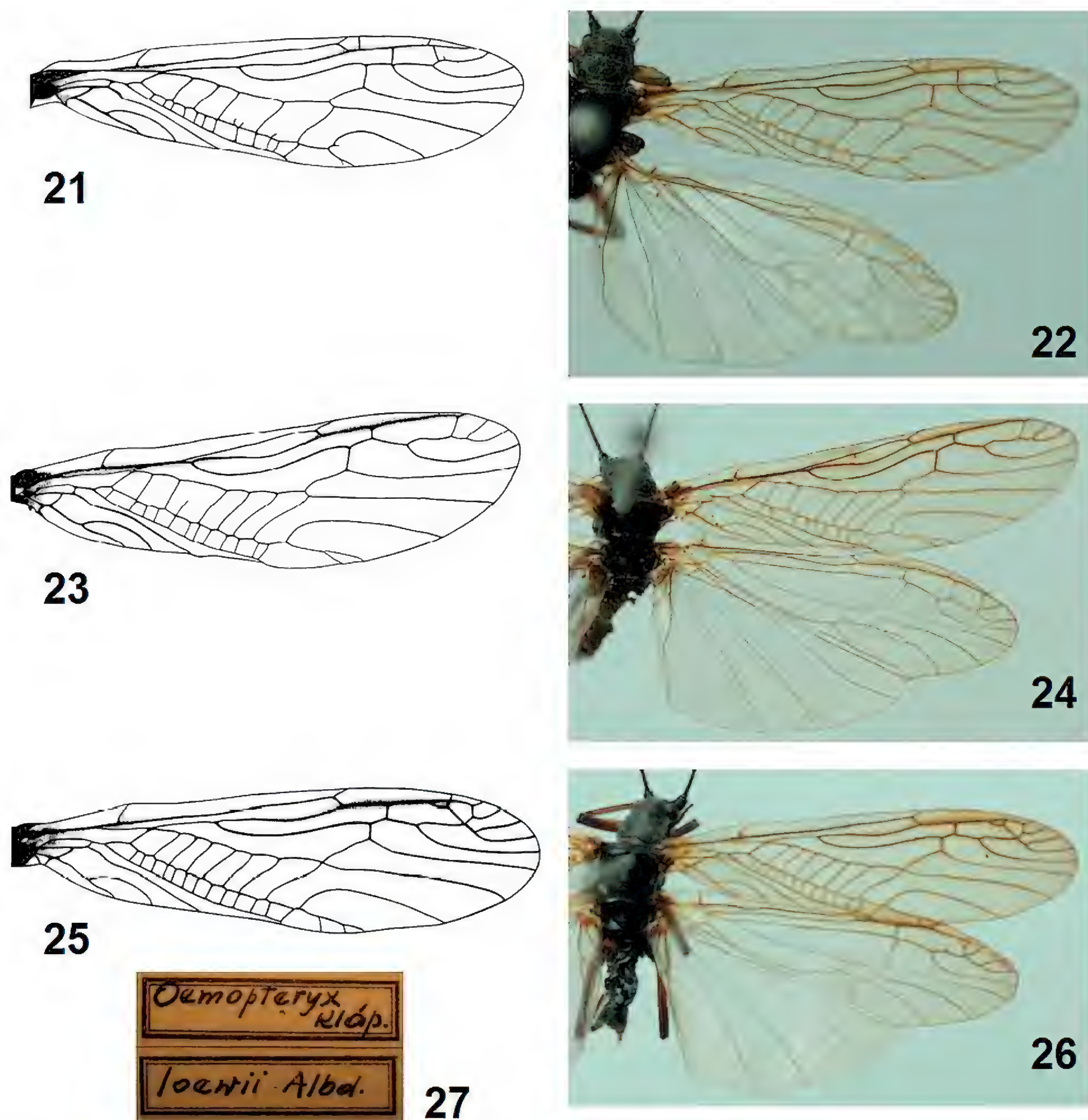
Figs 21–27

Material. ISEA: UKRAINE: “8/5 Kł”, “114/5”, CCA (JD), 2♀♀; “20/4 Kł”, “158/40”, CCA (JD), 1♀; “112/5”, CCA (JD), 1♀; others: “146/10” (JD), 2♀♀ (Fig. 27).

Remarks. This species was considered to be extinct for almost 100 years on the territory of Ukraine. According to Fiałkowski & Kittel (2002), the reliable records of *O. loewii* from Poland (Beskid Zachodni: Beskid Sądecki: Rytro) were published by Dziędzielewicz (1918) and Wojtas (1962), but their information about presence of the species in the Pieniny Range within Polish Carpathians is erroneous (Fiałkowski & Kittel 2002).

The precious specimens from Kolomyia (Ivano-Frankivska Region: Ukraine) were listed in the paper of Dziędzielewicz (1918). Besides these specimens, the finds from vicinity of Lviv (Kryvchytsi was a village at far vicinity of the city; now it is vicinity of Lviv) are mentioned in the same paper. It is interesting that *O. loewii* is known mostly from larger lowland rivers (Soldán et al. 1998; Zhiltzova 2003). Nevertheless, both sampling stations mentioned by J. Dziędzielewicz are characterized by the presence of the middle-sized cismountains part of river (e.g., Prut River near Kolomyia town), and only small streams around of Kryvchytsi.

Among the specimens studied by us, the wings have some variability in venation. Most of the key characters of the forewing venation are well preserved. However, *Sc* is not so short as it described in Zhiltzova (2003), e.g., do not reach the half of the wing length. Among the specimens in ISEA collection, *Sc* reach 2/3 of the wing length (Figs 23, 24). Two specimens have an additional *c-r* vein instead of one (Figs 21, 22, 25, 26), and a single specimen is characterized by the presence of *RS* branch divaricates medially (Figs 23, 24). Additionally, one specimen has four branches instead of three, and three anterior branches divaricate (Figs 25, 26). *Cu₁* has one additional branch, however, the shape of this furcation differs from those depicted by Zhiltzova (2003). The pterostigma between *C* and *R* is obvious, that has not been mentioned before (Figs 22, 24, 26).



Figs 21–27. *Oemopteryx loewii* (Albarda, 1889), ♀♀, Ukraine. **21, 23, 25.** Forewings of separate specimens. **22, 24, 26.** Body, fore- and hind wings of separate specimens. **27.** Original labels. The specimens are deposited in ISEA collections. Without any scales.

Genus *Rhabdiopteryx* Klapálek, 1902

Rhabdiopteryx harperi Vinçon & Murányi, 2009

Material. *ISEA:* UKRAINE: “Chomiak. Błotek. 2.VI.1909”, “136/24”, GOR (JD), 2♂♂, “85/1”, (CU), 1♀.

Remarks. The species was identified for the first time from the old collections. Previously, this species was published as *Rhabdiopteryx alpina* Kühtreiber, 1934 from the Carpathians (see Vinçon & Murányi 2009). In the Polish Carpathians, *R. harperi* is known from the

Bieszczady, and in the Ukrainian Carpathians from the Tysa river-basin.

Genus *Taeniopteryx* Pictet, 1841

Taeniopteryx nebulosa (Linnaeus, 1758)

Material. *ISEA:* POLAND: “Kraków 10/IV 86 Ogr. bot”, “K. Jelski”, “K. Jelski”, MAP (KJ), 1♂; “Oświęcim 5.III nad Sołą”, SG (CU), 1♂.

Remarks. *Taeniopteryx nebulosa* is known from the Prut and Dnister river-basins in Ukraine, and from the

Western Sudety, Western and Eastern Beskid Ranges, and Tatry Mts. in Poland (Fiałkowski & Kittel 2002).

Taeniopteryx spp.

(damaged and incomplete specimens)

Material. ISEA: POLAND: “Wad”, “82/1”, PS (CU), 2?; *others*: “143/10”, (JD), 2?; “144/10” (CU), 1?; “156/4” (CU), 1?; “143/10” (CU), 1?; (CU), 4♂♂.

Family **Nemouridae** Newman, 1853

Genus *Amphinemura* Ris, 1902

Amphinemura triangularis (Ris, 1902)

Material. ISEA: POLAND: “Myślenice. 11.VIII.1909”, “125/24”, MAP (JD), 1♂.

Remarks. There was no mention about any of species of the genus *Amphinemura* in J. Dziędzielewicz’ papers. Most probably in his contributions *Amphinemura* was identified as another genus/species.

Genus *Nemoura* Latreille, 1796

Nemoura cinerea (Retzius, 1783)

Material. ISEA: UKRAINE: “Tatarów. (Błotek.) 16.-7.-1905. Dz.”, “91/”, GOR (JD), 1♀; “Podole okol Rakutowej Kamieniecki”, WPOD (? JD), 1♂; POLAND: “Kraków 10/IV 86 Ogr. bot” “K. Jelski”, MAP (KJ), 1♀; “Jordanów 7.8.1921”, BM (JF), 1♀; “Jordanów 9.8.1921”, BM (JF) 1♀; “Kobierzyn 26.V.1921” MAP (JF), 1♀.

Remarks. This species is widespread all over Polish and the Ukrainian Carpathians.

Nemoura spp.

(damaged and incomplete specimens)

Material. ISEA: UKRAINE: “22.6.1902 Białohorszcza”, “153/17”, ROZ (JD), 1♀; “1/4 Kł”, “111/5”, CCA (JD), 1♀ [*very damaged specimen*]; “Mykietyńce. Stanisławów”, “89/1”, CCA (JD), 1?; “Ag”, “22/3”, CCA (JD), 1?; POLAND: “Krak? Jabłoński”, MAP (PJ), 1♀ [*very damaged specimen*]; “Kobierzyn 26.V.1921” MAP (JF), 1♀; *others*: “152/4”, (CU), 1♂;

Genus *Nemurella* Kempny, 1898

Nemurella pictetii Klapálek, 1900

Material. ISEA: UKRAINE: “1.6.1902. Hołosko w.”, “155/17”, “*Nemurella* Kemp. *picteti* Kláp.”, “*incospicua*, Pict.”, PH (JD), 3♂♂; “Hołosko, 1902.15.9” “155/17”, “*Nemurella* Kemp. *picteti* Kláp.”, “*incospicua*, Pict.”, PH (JD), 1♂.

Remarks. These specimens were collected near Lviv City by J. Dziędzielewicz, but in his paper he mentioned *N. pictetii* from the Svydivets Range. Despax (1935) pointed it for the Chornohora Range within the Ukrainian Carpathians. This species is considered to be ubiquist (Zhiltzova 2003). In the Ukrainian Carpathians *N. pictetii* was found in Tysa, Prut (Despax 1935; Zhiltzova 1966, 1967) and Seret river-basins in small streams with gravel or sand bottom and in the alpine lakes (Diakiv 2011). Martynov et al. (2017) reported this species from Eastern Ukraine in Starobilsk slope-elevated, West-Donetsk slope-elevated and Donetsk elevated physiographic areas.

Genus *Protonemura* Kempny, 1898

Protonemura praecox (Morton, 1894)

Material. ISEA: UKRAINE: “Mikuliczyn. 1902.13.8.”, “154/17”, GOR (JD), 1♂.

Remarks: There are no mentions about *P. praecox* in J. Dziędzielewicz’ papers. Probably the species was identified as another taxon.

Protonemura spp.

(damaged and incomplete specimens)

Material. ISEA: POLAND: “Rytro”, “32/13”, SAB (FS), 1?; “118/5” (CU), 1?.

Nemouridae spp.

(damaged and incomplete specimens)

Material. ISEA: UKRAINE: “22.6.1902. Białohorszcze.”, “153/17”, CCA (JD), 3?; “92 Młodiatyn”, “149/10”, CCA (JD), 1?; “24/5 Kł.”, “119/5”, CCA (JD), 1?; “12/7 Kł.”, “75(8)”, CCA (JD), 1?; “25/5 K.”, “162/4”, (CU), 1?; “dol. Białego”, “148/10”, (?JD), 1?; “Mykietyńce. Stanisławów”, “89/1”, CCA (JD), 3?; “Sopów”, “150/10”, CCA (CU), 3?; “Myślenice Oklejna. 14.VIII.1909”, “127/27”, MAP (JD), 1?; “Ag”, “23/3”, CCA (JD), 4?; “Jabłonica za Tartarówem. 8.-7.-1905. Dz.”, “93/20”, CHOR (JD), 1?; “Mikuliczyn.1902.21.7.”, “152/17”, GOR (JD), 1?; “Mikuliczyn. 1902.24.7.”, “152/17”, GOR (JD), 1?; “Mikuliczyn. 1902.25.7.”, 154/17”, GOR (JD), 1?; “Chomiak. pot. Bogdan. 19.-7.-1905. Dz.”, “92/20”, GOR (JD), 1?; “Chomiak. (Barania.) [źródło].5.-7.-1905. Dz.”, “94/20”, GOR (JD), 1?; “Worochta. Okolice. 13.-7.-1907”, CHOR (JD), 1?; “Czarnohora. Koźmieska. 2.-X.1909”, “133/24”, CHOR (JD), 1?; “Czarnohora. Koźmieska. 2.-X.1909”, “124/24”, CHOR (JD), 1?; POLAND: “Tatry 8/2”, “152/10”, T (JD), 1?; “Tatry. 8/2”, “154/10”, T (JD), 2?; “26/8 Zak”, “92/1”, T (CU), 1?; “Rytro”, “31/13”, SAB (FS), 1?; “Rytro”, “29/13”, SAB (FS), 1?; “161/4”, 1?; “Wad”, “90/1”, PS (CU), 1?; “Wad”, “93/1”, PS (CU), 1?; “Babia Góra. Za-

woja. 25.VII.1909”, T (JD), 1?; *others*: “151/10” (CU), 1?; “118/5”, (CU), 1?; “163/4” (CU), 1?; “117/5”, (CU), 1?; “12/3 Wz.”, “160/4”, (CU), 1?; “16/8 Bramka”, “91/1”, (CU), 1?.

Further specimens of Plecoptera from Ukraine in the collection of NMP

There are more than hundred Nemouridae, a few dozens *Leuctra* and several *Isoperla* specimens from Ukraine left unrevised in the collection of the NMP. Most of these are lacking identification labels, and are pinned after series of common species like *N. cinerea*, or simply stored among unidentified materials. Since the F. Klapálek collection arrived to the NMP in chaotic order after World War II (Murányi & Li 2015), most of the old Ukrainian specimens should be originally identified and readily published by J. Dziędzielewicz or F. Klapálek. Re-identification of these pinned specimens will need considerable further efforts, and since no possible types are included, we postponed this work.

After revising materials of the old collections, species, whose occurrence in Ukraine has been questioned, have been confirmed. The revised material contains information about localities that were not mentioned in the old publications. The brief remarks on these findings based on redetermined collections are listed in the article.

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REFERENCES

- Andrikovics S, Murányi D (2001) A checklist of stoneflies with remarks of published, undocumented species and two species new to the Hungarian fauna (Insecta: Plecoptera). *Folia entomologica hungarica* 62: 23–35
- Arkhipova KhI, Rizun VB, Martynov AV, Godunko RJ (2018) The model collections of aquatic insects of Ukraine: conceptual approaches to the formation, replenishment and functioning. *Studia Biologica* 12 (2): 99–116 [in Ukrainian, English summary]. <https://doi.org/10.30970/sbi.1202.564>
- Aubert J (1948) Un pléoptère nouveau des Préalpes vaudoises: *Leuctra autumnalis* n. sp. *Mitteilungen der Schweizerischen Entomologischen Gesellschaft* 21 (3): 469–470
- Bogoesco C, Tabacaru I (1960) Contribution à l’étude des *Leuctra* (Pléoptères) des Carpathes roumaines. *Mitteilungen der Schweizerischen Entomologischen Gesellschaft* 33 (1–2): 91–96
- Bojková J, Soldán T (2013) Stoneflies (Plecoptera) of the Czech Republic: species checklist, distribution and protection status. *Acta Entomologica Musei Nationalis Pragae* 53 (2): 443–484
- Braasch D, Joost W (1971) Zur Plecopterenfauna Bulgariens. *Limnologica, Berlin* 8 (2): 265–294
- Brinck P (1949) Studies on Swedish stoneflies (Plecoptera). *Opuscula Entomologica Suppl.* 11: 1–250
- Burmeister HCC (1839) *Plecoptera. Handbuch der Entomologie, Berlin* 2 (2): 863–881
- Despax R (1933) Pléoptères récoltés par le Dr Fudakowski dans le Massif de la Czarnohora (Carpathes orientales polonaises). *Bulletin de la Société entomologique de France* 38: 77–80
- DeWalt RE, Maehr MD, Neu-Becker U, Stueber G (2018) Plecoptera Species File Online. Version 5.0/5.0. Available from: <http://Plecoptera.SpeciesFile.org> (25 November 2018)
- Diakiv KhI (2010) Fauna of stoneflies (Insecta: Plecoptera) of the Dnister river basin. [*Fauna vesnyanok (Insecta: Plecoptera) basinu r. Dnister*]. *Naukovyi visnyk Uzhgorodskogo Universytetu, Seriya Biologiya* 28: 100–105 [in Ukrainian, English summary]
- Diakiv KhI (2011) Fauna of stoneflies (Insecta: Plecoptera) of the Ukrainian Carpathians. [*Fauna vesnyanok (Insecta: Plecoptera) Ukrainiskih Karpat*]. *Scientific Issue of the Ternopil Volodymyr Hnautik National Pedagogical University, Series Biology* 3 (48): 62–69 [in Ukrainian, English summary]
- Dziędzielewicz J (1877) Wykaz Prasiatnic i Sieciarek na porzeczah Prutu po Kołomyję i Bystrzycy nadworniańskiej. *Pamiętnik Towarzystwa Tatrzańskiego* 2: 68–75
- Dziędzielewicz J (1883) Sieciówki (Neuroptera) zebrane w okolicach Kołomyi i nad Dniestrem w r. 1882 / J. Dziędzielewicz. *Sprawozdania Komisji Fizjograficznej Akademii Umiejętności w Krakowie* 17: 1–9 (244–252)
- Dziędzielewicz J (1891) Przegląd fauny krajowej owadów siatkoskrzydłych (Neuroptera, Pseudoneuroptera). *Sprawozdania Komisji Fizjograficznej Akademii Umiejętności w Krakowie* 26: 26–151
- Dziędzielewicz J (1895) Zestawienie zapisków o owadach siatkoskrzydłych w Tatrach podczas pobytu w latach 1891 i 1892. *Sprawozdania Komisji Fizjograficznej Akademii Umiejętności w Krakowie* 30: 1–40
- Dziędzielewicz J (1908) Sieciarki (Neuroptera genuina) i Prasiatnice (Archiptera). *Sprawozdania Komisji Fizjograficznej Akademii Umiejętności w Krakowie* 42: 13–25
- Dziędzielewicz J (1918) Owady siatkoskrzydłowe ziem Polski (*Insecta neuropteroidea Poloniae terrarum*). II. *Rozprawy i Wiadomości z Muzeum im. Dzieduszyckich. Lwów* 4 (2): 1–73
- Fiałkowski W, Kittel W (2002) Widelnice, Plecoptera. *Catalogus Faunae Poloniae. Katalog Fauny Polski* 16 (3): 1–72
- Fochetti R, Tierno de Figueroa JM (2006) Notes on diversity and conservation of the European fauna of Plecoptera (Insecta). *Journal of Natural History* 40 (41–43): 2361–2369. <https://doi.org/10.1080/00222930601051386>
- Godunko RJ, Kłonowska-Olejek M (2003) Stoneflies (Insecta: Plecoptera) collections in the State Museum of Natural History, National Academy of Sciences of Ukraine (L’viv) and Institute of Systematics and Evolution of Animals, Polish Academy of Sciences (Kraków). *Naukovi zapysky Derzhavnoho pryrodnavchoho muzeyu* 18: 23–28
- Godunko RJ, Klymyshyn O (2004) Scientific heritage of Józef Dziędzielewicz. *Naukovi zapysky Derzhavnoho pryrodnavchoho muzeyu* 19: 187–190 (in Ukrainian, English summary)
- Graf W, Weinzierl A (1999) Bemerkenswerte Arten der *Leuctra prima*-Untergruppe (Insecta: Plecoptera) aus den Ostalpen. *Lauterbornia* 37: 31–34

- Graf W (1999) Check-Liste der Steinfliegen (Insecta: Plecoptera) Österreichs. *Lauterbornia* 37: 35–46
- Graf W, Popijač A, Previšić A, Gamboa M, Kučinić M (2012) Contribution to the knowledge of *Siphonoperla* in Europe (Plecoptera: Chloroperlidae): *Siphonoperla korab* sp. n. *Zootaxa* 3164: 41–48. <https://doi.org/10.11646/zootaxa.3164.1.4>
- Guérin-Méneville FE (1943) Genre *Perle*. In: Guérin-Méneville, F.E. (Ed.), *Iconographie du Règne animal de G. Cuvier. Insectes*: 393–395
- Ikonomov P (1986) Pléoptères de Macédoine (Insecta, Plecoptera). Taxonomie et distribution. *Acta Musei Macedonici Scientiarum Naturalium* 18 (4): 81–124
- Kačanski D (1972) *Leuctra signifera jahorinensis* n. ssp., eine neue Plecopteren-Subspecies aus Jugoslawien. *Mitteilungen der Schweizerischen Entomologischen Gesellschaft* 45 (1–3): 37–41
- Kačanski D (1973) Plecoptera sliva gornjeg toka reke Bosne. *Glasnik Zemaljskog Muzeja, Sarajevo* 10 (1971): 103–118
- Kačanski D, Baumann RW (1981) Notes on the Plecoptera fauna of the Morača River drainage. Pp. 304–307 in: Karaman G.S. & Beeton A.M. (eds) *The biota and limnology of Lake Skadar*. Titograd: 304–307
- Kempny P (1898) Zur kenntniss der Plecopteren. II. Neue und ungenügend bekannte *Leuctra*-Arten. III. Theile. *Verhandlungen der Zoologisch-Botanischen Gesellschaft in Wien* 49: 269–278
- Kis B (1963a) Zur kenntnis der Plecopteren-Fauna Rumäniens. *Folia entomologica hungarica* 16 (3): 67–82
- Kis B (1963b) Zwei neue Plecopteren-Arten aus Rumanien. *Reichenbachia* 1963 (1): 299–302
- Kis B (1966) *Leuctra carpathica* n. sp., eine neue Plecopteren-Art aus Rumänien. *Mitteilungen der Schweizerischen Entomologischen Gesellschaft* 39 (1–2): 99–102
- Kis B (1974) Plecoptera. Fauna Republicii Socialiste Romania 8: 1–271
- Klapálek F (1901) O nových a málo známých družích palaearktických Neuropteroid. *Rozpravy České Akademie Cisaře Františka Josefa* 10 (21): 1–19
- Klapálek F (1904) Evropské druhy čeledě Dictyopterygidae. *Rozpravy České Akademie Cisaře Františka Josefa* 13 (17): 1–10
- Klapálek F (1906) Revise a synopsis Evropských Dictyopterygid. *Rozpravy České Akademie Cisaře Františka Josefa* 15 (32): 1–35
- Klapálek F (1907) Evropské druhy rodu *Perla* Geoffr. *Rozpravy České Akademie Cisaře Františka Josefa* 16 (16): 1–25
- Kolenati FA (1860) Einige neue Insekten-Arten vom Altvater (dem hohen Gesenke der Sudeten). *Wiener Entomologische Monatschrift* 4 (12): 381–394
- Kovács T (2006) Data to the Hungarian distribution of Plecoptera. *Folia historico naturalia Musei Matraensis* 30: 181–188
- Kovács T, Godunko RJ (2008a) Faunistical records of larvae of Ephemeroptera, Odonata and Plecoptera from the Zakarpats'ka Region, Ukraine. *Folia Historico Naturalia Musei Matraensis* 32: 87–91
- Kovács T, Godunko RJ, Juhász P, Kiss B, Müller Z (2008b) Quantitative records of larvae of Ephemeroptera, Odonata and Plecoptera from the Zakarpats'ka Region, Ukraine (2004, 2006). *Folia Historico Naturalia Musei Matraensis* 32: 135–147
- Majewski E (1885) Owady żyłkoskrzydłe (Neuroptera Polonica). Systematyczny wykaz krajowych sieciarek i prasiatnic. *Materyały do fauny krajowej*: 18–21
- Martynov AV, Žiak M, Arkhipova KhI (2017) Stoneflies (Insecta, Plecoptera) of Eastern Ukraine: species list with data on distribution and habitat preferences. *Ukrainian Entomological Journal* 2 (13): 3–18
- McLachlan R (1872) Perlides. In: *Non-Odonates (Second part, Matériaux pour une faune névroptérologique de l'Asie septentrionale)*, by de Sélys-Longchamps & McLachlan. *Annales de la Société entomologique Belgique* 15: 47–55
- Mosely ME (1932) A revision of the European species of the genus *Leuctra*. *Annals and Magazine of Natural History* 10 (10): 1–41
- Murányi D (2006) Review and contribution to the Plecoptera fauna of Maramureș, Romania. *Studia Universitatis Vasile Goldiș Arad* 17: 85–94
- Murányi D (2007) New and little-known stoneflies (Plecoptera) from Albania and the neighbouring countries. *Zootaxa* 1533: 1–40. <https://doi.org/10.11646/zootaxa.1533.1.1>
- Murányi D (2008) The stonefly (Plecoptera) fauna of Montenegro. In: Pešić V. (ed.) *The Book of Abstracts and Programme, III International Symposium of Ecologists of Montenegro, Herceg Novi, 08–10.10.2008*: 98
- Murányi D (2011) Balkanian species of the genus *Isoperla* Banks, 1906 (Plecoptera: Perlodidae). *Zootaxa* 3049 (1): 1–46. <https://doi.org/10.11646/zootaxa.3049.1.1>
- Murányi D, Kovács T (2015) Review and contribution to the Plecoptera fauna of Sălaj county, Romania. *Studia Universitatis Vasile Goldiș Arad* 25 (4): 255–258
- Murányi D, Li WH (2015) Klapálek's *Kamimuria* (Plecoptera: Perlidae) types in the National Museum Prague. *Opuscula Zoologica, Budapest* 46 (2): 159–175
- Panzer GWF (1799) *Fauna Insectorum Germanicae initia*. Nürnberg, Felssecker: 1–71
- Pawłowski, J. (2003) *Invertebrates. Carpathian list of endangered species*, Vienna-Kraków: 39–46
- Petrović A, Simić V, Milošević D, Paunović M, Sivec I (2014) Diversity and distributional patterns of stoneflies (Plecoptera) in the aquatic ecosystems of Serbia (Central Balkan Peninsula). *Acta Zoologica Bulgarica* 66 (4): 517–526
- Pictet FJ (1841) *Histoire naturelle des insectes Névroptères. Famille des Perlides*. Kessmann-Baillière, Genève-Paris: 1–423
- Raušer J (1964) Verbreitungsgeschichte der tschechoslowakischen Plecopteren-Assoziationen. *Gewässer und Abwässer* 34–35: 115–129
- Raušer J (1965) Pléoptères nouveaux pour la Tchécoslovaquie. *Mitteilungen der Schweizerischen Entomologischen Gesellschaft* 37 (3): 157–163
- Ravizza C, Vinçon G (1998) Les Leuctridés (Plecoptera, Leuctridae) des Alpes. *Mitteilungen der Schweizerischen Entomologischen Gesellschaft* 71 (3–4): 285–342
- Ravizza C (2002) *Atlas of the Italian Leuctridae (Insecta, Plecoptera) with an appendix including Central European species*. *Lauterbornia* 44: 1–42
- Retzius AJ (1783) *Caroli de Geer genera et species insectorum*. Cruse, Lipsiae: 1–220
- Reusch H, Weinzierl A (1999) Regionalisierte Checkliste der aus Deutschland bekannten Steinfliegenarten (Plecoptera). *Lauterbornia*, 37: 87–96
- Sartori M, Membiela P, Ravizza C, Sánchez-Ortega A, Zwick P (1990) Liste des types déposés au Musée de zoologie, Lausanne. 1. Plecoptera (Insecta). *Bulletin de la Société Vaudoise des Sciences Naturelles* 80 (2): 165–190
- Sivec I, Stark BP (2002) The species of *Perla* (Plecoptera: Perlidae): evidence from egg morphology. *Scopolia* 49: 1–33
- Soldán T, Zahrádková S, Helešic J, Dušek L, Landa V (1998) Distributional and Quantitative Patterns of Ephemeroptera and Plecoptera in the Czech Republic: A Possibility of Detection of Long-term Environmental Changes of Aquatic Bio-

- topes. Folia Facultatis Scientiarum Naturalium Universitatis Masarykianae Brunensis, Biologia 98: 1–305
- Sowa R (1970) Note sur quelques Plécoptères de la Pologne. Bulletin de l'Académie Polonaise des Sciences 18: 153–157
- Teslenko VA, Zhiltzova LA (2009) Key to the stoneflies (Insecta, Plecoptera) of Russia and adjacent countries. Imagines and nymphs (in Russian). Dalnauka, Vladivostok: 382
- Teslenko VA (2012) A taxonomic revision of the genus *Arcynopteryx* Klapálek, 1904 (Plecoptera, Perlodidae). Zootaxa 3329: 1–18. <https://doi.org/10.11646/zootaxa.3329.1.1>
- Theissinger K, Bálint M, Feldheim KA, Haase P, Johannesen J, Laube I, Pauls SU (2012) Glacial survival and post-glacial recolonization of an arctic-alpine freshwater insect (*Arcynopteryx dichroa*, Plecoptera, Perlodidae) in Europe. Journal of Biogeography 40 (2): 236–248.
- Újhelyi S (1969) Data to the knowledge of the distribution of stone flies (Plecoptera) in Hungary. Opuscula Zoologica, Budapest 9 (1): 171–182. <https://doi.org/10.1111/j.1365-2699.2012.02793.x>
- Vinçon G, Murányi D (2009) Revision of the *Rhabdiopteryx neglecta* species group (Plecoptera: Taeniopterygidae). Aquatic Insects 31: 203–218. <https://doi.org/10.1080/01650420802517152>
- Weiss S, Stradner D, Graf W (2012) Molecular systematics, evolution and zoogeography of the stonefly genus *Siphonoperla* (Insecta: Plecoptera, Chloroperlidae). Journal of Zoological Systematics and Evolutionary Research 50 (1): 19–29. <https://doi.org/10.1111/j.1439-0469.2011.00639.x>
- Wojtas F (1962b) Stan poznania fauny wielkich (Plecoptera) w Polsce. Przegląd zoologiczny, Wrocław 6: 162–167
- Zhiltzova LA (1964) Die Plecopteren des europäischen teiles der Sowjetunion und des Kaukasus. Gewässer und Abwässer 34–35: 101–114
- Zhiltzova LA (1966) Vesnyanki (Plecoptera) evropeiskoi chasti SSSR (bez Kavkaza). [The stoneflies (Plecoptera) of the European part of USSR (without Caucasus)]. Entomologicheskoe obozrenie 45 (3): 525–549 [in Russian]
- Zhiltzova LA (1967) Obzor vesnyanok (Plecoptera) Ukrainiskikh Karpat. I. Semeistva Taeniopterygidae i Nemouridae. [The overview of stoneflies (Plecoptera) of the Ukrainian Carpathians. I. The families Taeniopterygidae and Nemouridae]. Vestnik zoologii 4: 34–42 [in Russian]
- Zhiltzova LA (1968) Obzor vesnyanok (Plecoptera) Ukrainiskikh Karpat. II. Semeistva Leuctridae, Capniidae, Perlodidae, Perlidae, Chloroperlidae. [The overview of stoneflies (Plecoptera) of the Ukrainian Carpathians. II. Leucteridae, Capniidae, Perlodidae, Perlidae, Chloroperlidae]. Vestnik zoologii 2: 61–66 [in Russian]
- Zhiltzova LA (1977) K faune i ekologii vesnyanok (Plecoptera) Ukrainiskikh Karpat. [To the fauna and ecology of the stoneflies (Plecoptera) of the Ukrainian Carpathians]. Entomologicheskoe obozrenie 56 (1): 43–52 [in Russian]
- Zhiltzova LA (2003) The stoneflies (Plecoptera): the group of Euholognatha. Fauna of Russia and adjacent countries. Nauka, St. Petersburg: 1–538 (in Russian)
- Žiak M (2016) Plecoptera Slovaca. Online at <http://www.plecopteraslovaca.eu> [accessed 22. Nov. 2018]
- Zwick P (1971) Die Plecopteren Pictets und Burmeisters, mit Angaben über weitere Arten (Insecta). Revue Suisse de Zoologie 78 (4): 1123–1194
- Zwick P (1982) The Stonefly Collection of F. Klapálek in Prague, with notes on the Nemouridae (Plecoptera). Aquatic Insects 4 (1): 39–48